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For related information see also *Astronautics*.

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SPACE SCIENCES

Includes space sciences (general); astronomy; astrophysics; lunar and planetary exploration; solar physics; and space radiation.
For related information see also *Geosciences.*

88 SPACE SCIENCES (GENERAL) **2860**

89 ASTRONOMY **2860**
Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

90 ASTROPHYSICS **2861**
Includes cosmology; and interstellar and interplanetary gases and dust.

91 LUNAR AND PLANETARY EXPLORATION **2863**
Includes planetology; and manned and unmanned flights.
For spacecraft design see *18 Spacecraft Design, Testing and Performance.* For space stations see *15 Launch Vehicles and Space Vehicles.*

92 SOLAR PHYSICS **2864**
Includes solar activity, solar flares, solar radiation and sunspots.

93 SPACE RADIATION **2865**
Includes cosmic radiation; and inner and cuter earth's radiation belts.
For biological effects of radiation see *52 Aerospace Medicine.* For theory see *73 Nuclear and High-Energy Physics.*

GENERAL

99 GENERAL **2866**

Note: N.A. means that no abstracts were assigned to this category for this issue.

SUBJECT INDEX **I-1**
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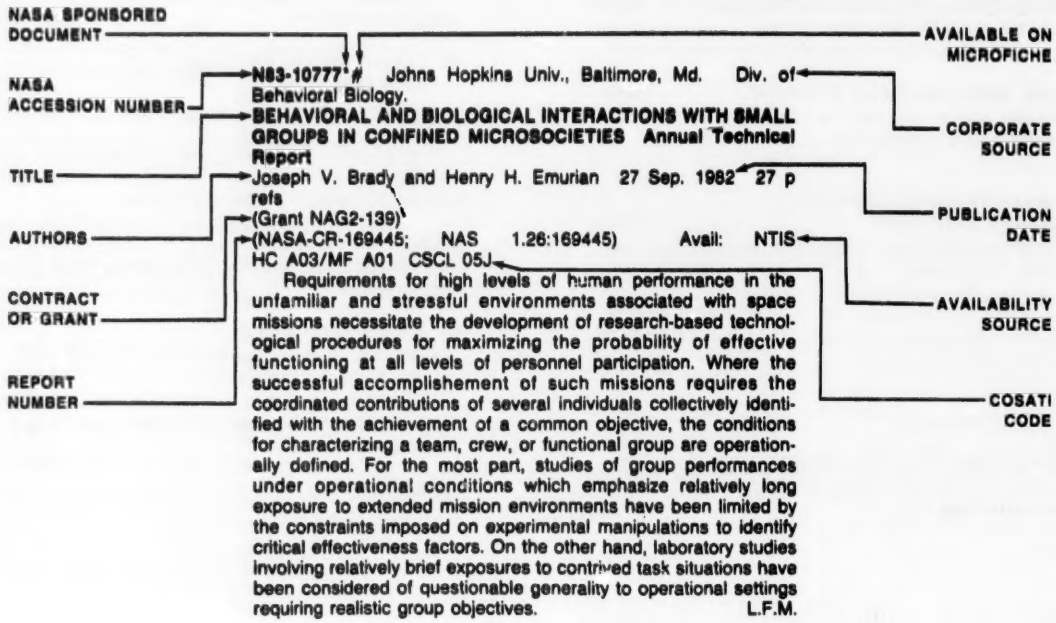
TYPICAL CITATION AND ABSTRACT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NASA ACCESSION NUMBER
N83-10777* # Johns Hopkins Univ., Baltimore, Md. Div. of Behavioral Biology.
CORPORATE SOURCE
TITLE
BEHAVIORAL AND BIOLOGICAL INTERACTIONS WITH SMALL GROUPS IN CONFINED MICROSOCIETIES Annual Technical Report
AUTHORS
Joseph V. Brady and Henry H. Emurian 27 Sep. 1982 27 p refs
PUBLICATION DATE
CONTRACT OR GRANT
(Grant NAG2-139)
REPORT NUMBER
(NASA-CR-169445; NAS 1.26:169445) Avail: NTIS HC A03/MF A01 CSCL 05J
AVAILABILITY SOURCE
COSATI CODE
Requirements for high levels of human performance in the unfamiliar and stressful environments associated with space missions necessitate the development of research-based technological procedures for maximizing the probability of effective functioning at all levels of personnel participation. Where the successful accomplishement of such missions requires the coordinated contributions of several individuals collectively identified with the achievement of a common objective, the conditions for characterizing a team, crew, or functional group are operationally defined. For the most part, studies of group performances under operational conditions which emphasize relatively long exposure to extended mission environments have been limited by the constraints imposed on experimental manipulations to identify critical effectiveness factors. On the other hand, laboratory studies involving relatively brief exposures to contrived task situations have been considered of questionable generality to operational settings requiring realistic group objectives. L.F.M.

VOLUME 21 NUMBER 17/SEPTEMBER 8, 1983

Scientific and Technical Aerospace Reports

A Semimonthly Publication of the National Aeronautics and Space Administration

01 AERONAUTICS (GENERAL)

N83-27950* National Aeronautics and Space Administration, Washington, D. C.
AERONAUTICAL ENGINEERING: A CONTINUING BIBLIOGRAPHY WITH INDEXES
Jun. 1983 127 p
(NASA-SP-7037(162); NAS 1.21:7037(162)) Avail: NTIS HC A07/MF A01 CSCL 01A

This bibliography lists 464 reports, articles and other documents introduced into the NASA scientific and technical information system in May 1983. Author

N83-27951*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
FLOW VISUALIZATION OF THE WAKE OF A TRANSPORT AIRCRAFT MODEL WITH LATERAL-CONTROL OSCILLATIONS
Frank L. Jordan, Jr. Jun. 1983 28 p refs
(NASA-TM-84623; L-15106; NAS 1.15:84623) Avail: NTIS HC A03/MF A01 CSCL 01B

An exploratory flow visualization study conducted in the Langley Vortex Research Facility to investigate the effectiveness of lateral control surface oscillations as a potential method for wake vortex attenuation on a 0.03 scale model of a wide body jet transport aircraft is described. Effects of both asymmetric surface oscillation (control surfaces move as with normal lateral control inputs) and symmetric surface oscillation (control surfaces move in phase) are presented. The asymmetric case simulated a flight maneuver which was previously investigated on the transport aircraft during NASA/FAA flight tests and which resulted in substantial wake vortex attenuation. Effects on the model wake vortex systems were observed by propelling the model through a two dimensional smoke screen perpendicular to the model flight path. Results are presented as photographic time histories of the wake characteristics recorded with high speed still cameras. Effects of oscillation on the wake roll up are described in some detail, and the amount of vortex attenuation observed is discussed in comparative terms. Findings were consistent with flight test results in that only a small amount of rotation was observed in the wake for the asymmetric case. A possible aerodynamic mechanism contributing to this attenuation is suggested. M.G.

N83-27952*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
PSUEDOSPECTRAL CALCULATION OF SHOCK TURBULENCE INTERACTIONS Final Report
Thomas A. Zang (Coll. of William and Mary, Williamsburg, Va.), D. A. Kopriva, and M. Yousuff Hussaini May 1983 14 p refs
(Contracts NAS1-16394; NAS1-17070; NAS1-17130; Grant NAG1-109)
(NASA-CR-172133; ICASE-83-14; NAS 1.26:172133) Avail: NTIS HC A02/MF A01 CSCL 01B

A Chebyshev-Fourier discretization with shock fitting is used to solve the unsteady Euler equations. The method is applied to shock interactions with plane waves and with a simple model of homogeneous isotropic turbulence. The plane wave solutions are compared to linear theory. Author

02 AERODYNAMICS

Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery.

For related information see also *34 Fluid Mechanics and Heat Transfer.*

N83-27953 Purdue Univ., Lafayette, Ind.
AEROTHERMODYNAMICS OF AXIAL-FLOW COMPRESSORS WITH WATER INGESTION Ph.D. Thesis
Toshiaki Tsuchiya 1982 326 p
Avail: Univ. Microfilms Order No. DA8225778

In order to establish the extent and nature of overall performance changes in an axial-flow air compressor with water-ingestion, an experimental investigation was conducted on a six-stage machine with (1) air-water droplet mixture flow and (2) air-methane mixture flow (methane substituted for water vapor). The results showed the manner in which various overall performance parameters became affected and deteriorated due to the presence of water and water vapor in the working fluid. The effect of water ingestion into a compressor was examined in terms of five processes related to the two-phase nature of the flow: (1) changes in the thermo-physical properties, (2) droplet-fluid-blade interaction, (3) aerodynamic performance change, (4) centrifugal action, (5) heat and mass transfer between the two phases and (6) droplet size adjustment. A numerical-computational program, the PURDU-WICSTK Code, was developed by incorporating the aforementioned six processes into a meanline scheme for the calculation of performance of compressors. Dissert. Abstr.

N83-27954 Purdue Univ., Lafayette, Ind.
APPROXIMATE METHODS FOR DYNAMIC ANALYSIS OF LARGE STRUCTURES Ph.D. Thesis
Bong Jun Kim 1982 227 p
Avail: Univ. Microfilms Order No. DA8225729

Many large frame and truss structures, although large in size and complex in detail, appear grossly as beams, plates, or shells. The dynamic behavior of these structures may be governed by the beam, plate or shell equations. Procedures for evaluating the equivalent beam and plate stiffness and masses based on the typical substructures of the original system are developed. The Shear beam, the Bernoulli-Euler beam, and the Timoshenko beam models are used to represent the beam-like frame and truss structures; the Mindlin type of plate theory is used to model truss platforms. A number of structures are studied for free vibration characteristics by using the full scale finite element method and by using the simple equivalent models. It was found that the simple

models are very accurate in predicting the natural frequencies and mode shapes. In general, the Timoshenko beam is more accurate than the shear beam and the Bernoulli-Euler beam models in the analysis of beam-like structures. Dissert. Abstr.

N83-27955 North Carolina State Univ., Raleigh.
THE CALCULATION OF AERODYNAMIC COEFFICIENTS OF SLENDER BODIES OF REVOLUTION AT ZERO ANGLES OF ATTACK, INCLUDING THE EFFECTS OF A THICK, TURBULENT, INCOMPRESSIBLE BOUNDARY LAYER Ph.D. Thesis
Yair Gay 1982 114 p
Avail: Univ. Microfilms Order No. DA8226651

A method for the calculation of aerodynamic coefficients of slender bodies of revolution at low angles of attack is presented. The accuracy of the method is enhanced by the inclusion of a thick turbulent boundary layer with curvature effects and pressure gradient across the boundary layer taken into account. The calculated displacement thickness is added to the body radii and the slender body theory is applied to the shape to obtain the aerodynamic coefficients. Comparisons are presented between calculated and experimental results; they extend from ogive cylinder configurations to boattailed bodies thus covering a wide range of boundary layer growth rate and curvature effects. The calculated coefficients differ by less than 10% from the experimental values; using a fine tuning method presented herein, the agreement is improved to within 5%. Dissert. Abstr.

N83-27956 Arizona Univ., Tucson.
NONLINEAR AERODYNAMICS OF CONICAL DELTA WINGS Ph.D. Thesis
Sivaguru Sornalingam Srithran 1982 101 p
Avail: Univ. Microfilms Order No. DA8227370

Steady, inviscid, supersonic flow past conical wings is studied within the context of irrotational, nonlinear theory. An efficient numerical method is developed to calculate cones of arbitrary section at incidence. The method is fully conservative and implements a body conforming mesh generator. The conical potential is assumed to have its best linear variation inside each cell; a secondary interlocking cell system is used to establish the flux balance required to conserve mass. In regions of supersonic cross flow, the discretization scheme is desymmetrized by adding the appropriate artificial viscosity in conservation form. The algorithm is nearly an order of magnitude faster then present Euler methods. It predicts known results as long as the flow Mach numbers normal to the shock waves are near 1; qualitative features, such as nodal point lift-off, are also predicted correctly. Results for circular and thin elliptic cones are shown to compare very well with calculations using Euler equations. Dissert. Abstr.

N83-27957*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
AERODYNAMIC PERFORMANCE OF A FAN STAGE UTILIZING VARIABLE INLET GUIDE VANES (VIGVS) FOR THRUST MODULATION
Richard R. Woollett 1983 17 p refs Presented at the 19th Joint Propulsion Conf., Seattle, 27-29 Jun. 1983; sponsored by AIAA, SAE and ASME
(NASA-TM-83438; E-1376; NAS 1.15:83438) Avail: NTIS HC A02/MF A01 CSCL 01A

An experimental research program was conducted in the Lewis Research Center's 9x15-foot (2.74x4.57 m) low speed wind tunnel to evaluate the aerodynamic performance of an inlet and fan system with variable inlet guide vanes (VIGVs) for use on a subsonic V/STOL aircraft. At high VIGV blade angles (lower weight flow and thrust levels), the fan stage was stalled over a major portion of its radius. In spite of the stall, fan blade stresses only exceeded the limits at the most extreme flow conditions. It was found that inlet flow separation does not necessarily lead to poor inlet performance or adverse fan operating conditions. Generally speaking, separated inlet flow did not adversely affect the fan blade stress levels. There were some cases, however, at high VIGV angles and high inlet angles-of-attack where excessive blade stress levels were encountered. An evaluation term made up of the product of the distortion parameter, K alpha, the weight flow and the fan pressure ratio minus one, was found to correlate quite well with the observed blade stress results. Author

N83-27958*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ANALYTICAL AND EXPERIMENTAL STUDY OF FLOW THROUGH AN AXIAL TURBINE STAGE WITH A NONUNIFORM INLET RADIAL TEMPERATURE PROFILE
John R. Schwab, Roy G. Stabe, and Warren J. Whitney 1983 23 p refs Presented at the 19th Joint Propulsion Conf., Seattle, 27-29 Jun. 1983; sponsored by the AIAA, SAE and ASME
(NASA-TM-83431; E-1722; NAS 1.15:83431; AIAA-83-1175) Avail: NTIS HC A02/MF A01 CSCL 01A

Results are presented for a typical nonuniform inlet radial temperature profile through an advanced single-stage axial turbine and compared with the results obtained for a uniform profile. Gas temperature rises of 40 K to 95 K are predicted at the hub and tip corners at the trailing edges of the pressure surfaces in both the stator and rotor due to convection of hot fluid from the mean by the secondary flow. The inlet temperature profile is shown to be mixed out at the rotor exit survey plane (2.3 axial chords downstream of the rotor trailing edge) in both the analysis and the experiment. The experimental rotor exit angle profile for the nonuniform inlet temperature profile indicates underturning at the tip caused by increased clearance. Severe underturning also occurs at the mean, both with and without the nonuniform inlet temperature profile. The inviscid rotational flow code used in the analysis fails to predict the underturning at the mean, which may be caused by viscous effects. Author

N83-27959*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
EFFECT OF TAIL-FIN SPAN ON STABILITY AND CONTROL CHARACTERISTICS OF A CANARD-CONTROLLED MISSILE AT SUPERSONIC MACH NUMBERS
A. B. Blair, Jr., Jerry M. Allen, and Gloria Hernandez Jun. 1983 86 p refs
(NASA-TP-2157; L-15586; NAS 1.60:2157) Avail: NTIS HC A05/MF A01 CSCL 01A

An experimental wind-tunnel investigation was conducted at Mach numbers from 1.60 to 3.50 to obtain the longitudinal and lateral-directional aerodynamic characteristics of a circular, cruciform, canard-controlled missile with variations in tail-fin span. In addition, comparisons were made with the experimental aerodynamic characteristics using three missile aeroprediction programs: MISSILE1, MISSILE2, and NSWCDM. The results of the investigation indicate that for the test Mach number range, canard roll control at low angles of attack is feasible on tail-fin configurations with tail-to-canard span ratios of less than or equal to 0.75. The conards are effective pitch and yaw control devices on each tail-fin span configuration tested. Programs MISSILE1 and MISSILE2 provide very good predictions of longitudinal aerodynamic characteristics and fair predictions of lateral-directional aerodynamic characteristics at low angles of attack, with MISSILE2 predictions generally in better agreement with test data. Program NSWCDM provides good longitudinal and lateral-directional aerodynamic predictions that improve with increases in tail-tin span. Author

N83-27960*# GMAF, Inc., Freeport, N.Y.
FAST EULER SOLVER FOR STEADY, 1-DIMENSIONAL FLOWS Final Report
Gino Moretti Jun. 1983 39 p refs
(Contract NAS3-22772)
(NASA-CR-3689; NAS 1.26:3689) Avail: NTIS HC A03/MF A01 CSCL 01A

A numerical technique to solve the Euler equations for steady, one dimensional flows is presented. The technique is essentially implicit, but is structured as a sequence of explicit solutions for each Riemann variable separately. Each solution is obtained by integrating in the direction prescribed by the propagation of the Riemann variables. The technique is second-order accurate. It

requires very few steps for convergence, and each step requires a minimal number of operations. Therefore, it is three orders of magnitude more efficient than a standard time-dependent technique. The technique works very well for transonic flows and provides shock fitting with errors as small as 0.001. Results are presented for subsonic problems. Errors are evaluated by comparison with exact solutions. Author

N83-27961*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

ON ISSUES CONCERNING FLOW SEPARATION AND VORTICAL FLOWS IN 3 DIMENSIONS

David J. Peake and Murray Tobak Jun. 1983 34 p refs Presented at the AGARD Fluid Dyn. Panel Symp. on Aerodyn. of Vortical-Type Flows in 3 Dimensions, Rotterdam, Apr. 1983

(NASA-TM-84374; A-9375; NAS 1.15:84374) Avail: NTIS HC A03/MF A01 CSCL 01A

This review provides an illustrated introduction laying the knowledge base for vortical flows about three dimensional configurations that are of typical interest to aerodynamicists and researchers in fluid mechanics. The paper then compiles a list of ten issues, again in illustrative format, that the authors deem important to the understanding of complex vortical flows. These issues and our responses to them provide, it is hoped, a skeletal framework on which to hang the ensuing conference proceedings. Author

N83-27962# General Dynamics Corp., Fort Worth, Tex.

FORCE AND PRESSURE MEASUREMENTS ON A RESEARCH MODEL WITH A LOW-, MID- AND T-TAIL AT MACH NUMBERS OF 0.60 TO 0.90. VOLUME 1: SUMMARY REPORT Final Report, 15 Apr. - 14 Dec. 1982

Ronald A. Cox Dec. 1982 64 p 2 Vol.

(Contract N00014-82-C-0340; RF41411801)

(AD-A124067; FZA-540-Vol-1) Avail: NTIS HC A04/MF A01 CSCL 01/3

An investigation of the effects of a low-, mid-, and T-Tail on configuration aerodynamics was carried out in the NASA/Ames Research Center 14-Foot Transonic Wind Tunnel. A baseline wing and a wing refined with the use of numerical optimization were tested alone and in conjunction with a horizontal tail in a low-, mid-, and T-Tail arrangement. Wing and horizontal tail pressure data and force data were obtained in the Mach number range 0.60 to 0.90 and at angles of attack from -6 to +28 deg. The all-flying horizontal tail was tested at deflection angles of -10, 0, and +10 deg. The refined wing showed positive drag improvements over most of the Mach number range. The low-tail proved to be slightly more favorable than the T-Tail at low CL's. Author (GRA)

N83-27963# Nielsen Engineering and Research, Inc., Mountain View, Calif.

WING-ALONE AERODYNAMIC CHARACTERISTICS TO HIGH ANGLES OF ATTACK AT SUBSONIC AND TRANSONIC SPEEDS Final Technical Report, 1 Apr. 1979 - 15 Sep. 1982

M. M. Briggs, R. R. Reed, and J. N. Nielsen Nov. 1982 358 p

(Contract DAAG29-79-C-0020)

(AD-A125764; NEAR-TR-269; ARO-16030.1-EG) Avail: NTIS HC A16/MF A01 CSCL 20/4

This report documents the results of a wind tunnel test conducted to determine the aerodynamic characteristics of unbanked wings from low to high angles of attack at subsonic and transonic speeds. Several wing models with differing planform geometry were tested. All wings were full-span with straight taper, zero trailing-edge sweep, constant bevel angle normal to all edges and constant thickness. The aerodynamic data obtained consisted of normal-force, axial-force, pitching-moment, yawing-moment, and semispan root bending-moment coefficients. Longitudinal, spanwise, and vertical aerodynamic centers of pressure were computed from the force and moment data. GRA

N83-27964# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany). Abteilung Trans-Ueberschall-Entwurfsverfahren.

KINEMATICS: INFLUENCE FUNCTIONS AND FIELD QUANTITIES FOR DISTURBANCE SOURCES

Arabindo Das 15 Oct. 1982 66 p refs In GERMAN; ENGLISH summary

(DFVLR-FB-83-01) Avail: NTIS HC A04/MF A01; DFVLR, Cologne DM 23,50

A unified method for deriving the influence functions of moving singularities which determine the field quantities in aerodynamics and aeroacoustics is presented. The moving singularities consist of volume and surface elements having arbitrary orientations in space and to the trajectory. Generally valid formulas for the influence functions are obtained which reveal universal relations and properties of the disturbance fields. The treatment elucidates classical concepts, and is uniformly valid for subsonic and supersonic Mach numbers. Author (ESA)

N83-27965# European Space Agency, Paris (France).

DRAG REDUCTION BY MEANS OF PNEUMATIC TURBULATORS

Karl-Heinz Horstmann and Armin Quast Sep. 1982 53 p refs Transl. into ENGLISH of "Widerstandsverminderung durch Blasturbulatoren" rept. DFVLR-FB-81-33 DFVLR, Brunswick, Sep. 1981 (ESA-TT-743; DFVLR-FB-81-33) Avail: NTIS HC A04/MF A01; original German version available from DFVLR, Cologne DM 11,40

Drag mechanisms of laminar separation bubbles and the impact on airfoil section design of drag reduction by pneumatic turbulators are discussed. At Reynolds number (R) = 1 million, drag reduction is of the order of 15%, the reduction decreasing as R increases. From about R = 4 million, hardly any further drag reduction occurs. Dynamic pressure can be admitted into the turbulator orifices, the drag caused by the turbulator air amounting to about 1% of the reduction in drag. The design philosophy applicable to airfoil sections with pneumatic turbulators should be based on the maximum R for the airfoil range of operation and not on the average R. The use of pneumatic turbulators enlarges the R range with low drag compared with previous airfoil sections. Author (ESA)

N83-27966# European Space Agency, Paris (France).

LAMINAR BOUNDARY LAYERS IN THE VICINITY OF THE ATTACHMENT LINE ON WINGS AND WINGLIKE BODIES AT INCIDENCE

Dieter Schwamborn Dec. 1982 194 p refs Transl. into ENGLISH of "Laminare Grenzschichten in der naehe der Anlegelinie an Fluegeln u. fluegelaehnlichen Koerpern mit Anstellung" rept. DFVLR-FB-81-31 DFVLR, Goettingen, West Germany, Aug. 1981 (ESA-TT-752; DFVLR-FB-81-31) Avail: NTIS HC A09/MF A01; original German version available from DFVLR, Cologne DM 29,80

A three dimensional model of the boundary layer flow in the vicinity of the leading edge of winglike bodies was developed, emphasizing flow characteristics close to the attachment line. The three dimensional laminar and incompressible flow equations around an ellipsoid are solved by finite difference methods. For the integration of these equations close to the attachment line, a difference scheme is presented, the stability and convergence of which are discussed. The existence of quasi-two dimensional streamlines outside the flow symmetry plane is treated. Results of computations for different angles to attack are shown. Computations proceed until detachment occurs. The existence of a pressure maximum and a shear stress minimum in the vicinity of the attachment line is established. Author (ESA)

N83-27967# Technische Hogeschool, Delft (Netherlands). Dept. of Aerospace Engineering.

AERODYNAMIC MODEL IDENTIFICATION FROM DYNAMIC FLIGHT TEST DATA AND WIND TUNNEL EXPERIMENTS

J. A. Mulder, J. G. denHollander, and H. Binkhorst Oct. 1982 23 p refs

(VTH-LR-361) Avail: NTIS HC A02/MF A01

The identification of multi-input, single output linear static models from flight test data is discussed. Models based on least

squares are considered. Wind tunnel scale model and flight test data on a propeller slipstream are compared. Dynamic flight test data were analyzed by reconstructing the flight path and forming a data base for the identification of aerodynamic models. Given the relatively low Reynolds number of the wind tunnel experiments, a reasonable correspondence exists between the dynamic flight test results and model predictions. Author (ESA)

03 AIR TRANSPORTATION AND SAFETY

Includes passenger and cargo air transport operations; and aircraft accidents.

For related information see also *16 Space Transportation* and *85 Urban Technology and Transportation.*

N83-27968# Federal Aviation Administration, Atlantic City, N.J.
FIRE CONTAINMENT CHARACTERISTICS OF AIRCRAFT CLASS D CARGO COMPARTMENTS Final Report, Aug. 1981 - Sep. 1982
David R. Blake and Richard G. Hill Mar. 1983 38 p refs
(FAA Proj. 181-350-400)
(FAA-CT-82-156) Avail: NTIS HC A03/MF A01

Eighteen tests were conducted in a 840-cubic foot simulated class D cargo compartment test article. Various ceiling lining materials, cargo loading configuration, air leakage rates, and fire sources were examined in a effort to determine the conditions likely to occur during a class D cargo compartment fire. The lining materials used in this project passed the requirements of FAR 25.853 and 25.855 (vertical and forty-five degree bunsen burner lab tests); however, they did not always successfully contain the cargo fires. The major conclusion of this study is that FAR 25.853 and 25.855 do not insure adequate burn-through resistance of class D cargo liners subjected to realistic fires. Author

N83-27969# Defence and Civil Inst. of Environmental Medicine, Downsview (Ontario).
WATER SURVIVAL: 20 YEAR3 CANADIAN FORCES AIRCREW EXPERIENCE
C. J. Brooks and K. W. Rowe Nov. 1982 27 p
(AD-A125401; DCIEM-82-R-61) Avail: NTIS HC A03/MF A01 CSCL 01/2

The object of this report is to review all the accidents involving the Canadian Forces, the Royal Canadian Air Force, Royal Canadian Navy and Army which involved ditching, ejection or bailing out into the sea or fresh water in the last 20 years in order to identify the incidence of water immersion and the percentage of accidents that occurred in sea or fresh water. These have been analysed to obtain knowledge as to which aircrew are at risk, whether the protection that is provided is adequate or could be improved or, indeed, whether some aircrew are over-protected. Finally, during 20 years of peacetime operation, an analysis will be made as to what the threat is to aircrew from the water temperature and sea state, in conjunction with the analysis of rescue times. Recommendations will be presented as to how our aircrew should be protected to the end of this decade. With the assistance of the computer at National Defence Headquarters/ Directorate of Flight Safety (Ottawa), it was possible to review 595 A, B and C class accidents. GRA

N83-27970# Textron Bell Helicopter, Fort Worth, Tex.
YAH-63 HELICOPTER CRASHWORTHINESS SIMULATION AND ANALYSIS Final Report, Jul. 1980 - Jun. 1982
V. L. Berry, J. D. Cronkhite, T. J. Haas, and G. Perry Feb. 1983 259 p refs
(Contract DAAK51-80-C-0027; DA Proj. 1L1-62209-AH-76)
(AD-A125642; USAAVRADCOM-TR-82-D-34) Avail: NTIS HC A12/MF A01 CSCL 14/2

Under its ongoing crash research testing program, the Army conducted drop test T-41 using a YAH-63 prototype helicopter as a test article. The YAH-63 was residual hardware from the AAH competition of the mid 70's and incorporated many crashworthy features, including a high energy landing gear, crushable fuselage structure, stroking crew seats, high strength retention of large masses, and a crash-resistant fuel system. The test was conducted in July 1981 at the NASA Langley Impact Dynamics Research Facility. Many onboard experiments were also evaluated in the drop test with participation from NASA, the Navy, and the Army. The KRASH results were compared to test and showed generally good agreement for landing gear energy absorption, fuselage crushing, nose structure failure, and copilot/gunner seat stroking and bottoming. The acceleration levels in the fuselage agreed well in the mid fuselage impact, but predicted levels were lower than test levels in the forward fuselage, probably due to the hard armament structure on the test article not represented in the KRASH model. The comparison of results was greatly facilitated by the DATAMAP program that processed both the test and KRASH data and automated the plotting, overplotting, scaling, filtering, and integrating of the data. GRA

04 AIRCRAFT COMMUNICATIONS AND NAVIGATION

Includes digital and voice communication with aircraft; air navigation systems (satellite and ground based); and air traffic control.

For related information see also *17 Spacecraft Communications, Command, and Tracking* and *32 Communications.*

N83-27971 Bundesanstalt fuer Flugsicherung, Frankfurt am Main (West Germany).
[ACTIVITIES REPORT ON AIR TRAFFIC SECURITY] Annual Report, 1981 [JAHRESBERICHT 1981]
Jun. 1982 44 p In GERMAN
Copyright. Avail: Issuing Activity

Measures for better air traffic safety, navigation and radiotelephony technology, information transmission technology, radar technology, and aerial survey technology are described. Author (ESA)

N83-27972# Naval Postgraduate School, Monterey, Calif. Dept. of Oceanography.
APPLICATION OF ADDITIONAL SECONDARY FACTORS TO LORAN-C POSITIONS FOR HYDROGRAPHIC OPERATIONS M.S. Thesis
Gerald E. Wheaton Oct. 1982 130 p refs
(AD-A125620) Avail: NTIS HC A07/MF A01 CSCL 08/10

The application of LORAN-C in the hyperbolic mode as a positioning system for hydrographic surveys was investigated. Observed LORAN-C time differences from a field test conducted in Monterey Bay, California were compared to calculated time differences determined from geographic positions based on a microwave positioning system. Four methods were used to determine the calculated time differences. The first three methods were (1) applying only the seawater Secondary Factory, (2) computing the time difference based on a Semi-Empirical TD Grid, and (3) applying ASF Correctors from the DMAHTC LORAN-C Correction Table. The final method applied multiple observed ASF Correctors at five minute latitude and longitude intervals. By applying multiple observed ASF Correctors, which was the most accurate method, a 38.3 meter 1 drms with a lane offset of 3 to 12 meters using the 9940 X-Y LORAN-C combination was obtained. Based upon the results presented, it may be possible to use LORAN-C for hydrographic surveys at scales of 1:80,000. GRA

N83-27973# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany). Abteilung Kreiselgeraete und Traegheitsnavigation.
FLIGHT TESTING OF A STRAPDOWN SYSTEM. RESULTS OF A SPECIAL FLIGHT TEST
Hans-Juergen Hotop Oct. 1982 44 p refs In GERMAN; ENGLISH summary Report will also be announced as translation (ESA-TT-818)

(DFVLR-Mitt-83-02; ESA-TT-818) Avail: NTIS HC A03/MF A01; DFVLR, Cologne DM 16,60

Instruments and data evaluation used in flight testing of the modular strapdown system (MSS) are described. Reference data, based on an inertial navigation system and optimal smoothing techniques, are shown for a flight test on the HFB 320 aircraft. The MSS flight tests were limited to the navigation part. The results show position errors of 10 km/hr maximum, speed errors of 8 m/sec maximum, elevation angle errors < 0.4, and course error drift of 0.4/hr. Author (ESA)

N83-27974# European Space Agency, Paris (France).
FLIGHT TESTING OF INERTIAL NAVIGATION SYSTEMS: HARDWARE AND SOFTWARE DESCRIPTION
Werner Lechner, Hans-Juergen Hotop, and Hans Peter Zenz Mar. 1983 93 p refs Transl. into ENGLISH of "Flugerprobung von Traegheitsnavigationssystemen Beschreibung der Mess- u. Auswertechnik" rept. DFVLR-Mitt-81-14 Brunswick, West Germany, May 1981
(ESA-TT-772; DFVLR-Mitt-81-14) Avail: NTIS HC A05/MF A01; original German version available from DFVLR, Cologne DM 20,20

Hardware and software were developed for the data evaluation of a flight measurement system consisting of inertial sensors on board the aircraft and ground-based flight path measurement stations. The results obtained are reference data for flight path, velocity, attitude angles and gyro drift. External measurements such as radar, cinetheodolites or TACAN, together with inertial data recorded in the aircraft, are evaluated by optimum smoothing techniques. Flight test results are presented. Author (ESA)

05 AIRCRAFT DESIGN, TESTING AND PERFORMANCE

Includes aircraft simulation technology.

For related information see also *18 Spacecraft Design, Testing and Performance* and *39 Structural Mechanics.*

N83-27975* National Aeronautics and Space Administration. Hugh L. Dryden Flight Research Center, Edwards, Calif.
ADAPTER FOR MOUNTING A MICROPHONE FLUSH WITH THE EXTERNAL SURFACE OF THE SKIN OF A PRESSURIZED AIRCRAFT Patent
Robert B. Cohn, inventor (to NASA) Issued 14 Jun. 1983 6 p Filed 14 Dec. 1981 Supersedes N82-24474 (20 - 15, p 2086)
(NASA-Case-FRC-11072-1; US-Patent-4,388,502; US-Patent-Appl-SN-230613; US-Patent-Case-179-179; US-Patent-Case-179-146-R; US-Patent-Case-367-906) Avail: US Patent and Trademark Office CSCL 01C

A mounting device for securing a microphone pick up head flush with respect to the external surfaces of the skin of an aircraft for detecting shock waves passing thereover is described. The mount includes a sleeve mounted internally of the aircraft for capturing and supporting an electronics package having the microphone pick up head attached thereto in a manner such that the head is flush with the external surface of the aircraft skin and a pressure seal is established between the internal and external surfaces of the aircraft skin.

Official Gazette of the U.S. Patent and Trademark Office

N83-27976# Virginia Univ., Charlottesville. School of Engineering and Applied Science.
OPTIMAL PASSIVE FREQUENCY RESPONSE CONTROL OF HELICOPTERS BY ADDED STRUCTURES
L. Kitis, W. D. Pilkey, and B. P. Wang Jul. 1982 25 p refs Backup document for AIAA Synoptic scheduled for publication in Journal of Aircraft in Sep. 1983 Sponsored by ARO
Avail: NTIS HC A02/MF A01

Two frequency response optimization methods for helicopters are developed by appending absorbers to the helicopter fuselage. The methods are suitable for discrete models with a large number of degrees of freedom and are applied to obtain optimal broadband response. Reanalysis and modal techniques are used in the structural dynamic analysis phase of the design algorithm and optimization is carried out by a feasible directions approach. The optimal design algorithm is illustrated by several numerical examples using a 39 DOF helicopter model with discrete conventional absorbers and beam absorbers. Author

N83-27977*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
A CONCEPTUAL FRAMEWORK FOR USING DOPPLER RADAR ACQUIRED ATMOSPHERIC DATA FOR FLIGHT SIMULATION
Warren Campbell Jun. 1983 16 p refs
(NASA-TP-2192; NAS 1.60:2192) Avail: NTIS HC A02/MF A01 CSCL 01C

A concept is presented which can permit turbulence simulation in the vicinity of microbursts. The method involves a large data base, but should be fast enough for use with flight simulators. The model permits any pilot to simulate any flight maneuver in any aircraft. The model simulates a wind field with three-component mean winds and three-component turbulent gusts, and gust variation over the body of an aircraft so that all aerodynamic loads and moments can be calculated. The time and space variation of mean winds and turbulent intensities associated with a particular atmospheric phenomenon such as a microburst is used in the model. In fact, Doppler radar data such as provided by JAWS is uniquely suited for use with the proposed model. The concept is completely general and is not restricted to microburst studies. Reentry and flight in terrestrial or planetary atmospheres could be realistically simulated if supporting data of sufficient resolution were available. Author

N83-27978*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
UNMANNED VEHICLE SYSTEMS EXPERIENCES AT THE DRYDEN FLIGHT RESEARCH FACILITY Final Report
Terrence W. Rezek Jun. 1983 22 p refs Presented at the AUVS-83 Symp. Unmanned Systems: Confidence for the 80's, Salt Lake City, 28-30 Jun. 1983
(NASA-TM-84913; H-1192; NAS 1.15:84913) Avail: NTIS HC A02/MF A01 CSCL 01C

An overview is presented of the remotely piloted research vehicle (RPRV) activities at the NASA Dryden Flight Research Facility from their beginning to the present. The development of RPRV's as flight test tools is discussed, and system configuration is presented. Solutions derived from human factors experience related to flight activities and pilot responses have contributed to overall system capability. The development and use of visual displays, which are a critical feature of successful RPRV flights, are discussed as well as directions for future RPRV efforts. Author

N83-27979*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
FACTORS INFLUENCING AIRCRAFT GROUND HANDLING PERFORMANCE
Thomas J. Yager Jun. 1983 32 p refs
(NASA-TM-85652; NAS 1.15:85652) Avail: NTIS HC A03/MF A01 CSCL 01C

Problems associated with aircraft ground handling operations on wet runways are discussed and major factors which influence tire/runway braking and cornering traction capability are identified including runway characteristics, tire hydroplaning, brake system anomalies, and pilot inputs. Research results from tests with instrumented ground vehicles and aircraft, and aircraft wet runway accident investigation are summarized to indicate the effects of different aircraft, tire, and runway parameters. Several promising means are described for improving tire/runway water drainage capability, brake system efficiency, and pilot training to help optimize aircraft traction performance on wet runways. S.L.

N83-27980*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

STRUCTURAL RESPONSE OF TRANSPORT AIRPLANES IN CRASH SITUATIONS

Robert G. Thomson and Caesar Caiafa (FAA Technical Center, Atlantic City) Jun. 1983 99 p refs
(NASA-TM-85654; NAS 1.15:85654) Avail: NTIS HC A05/MF A01 CSCL 01C

This report highlights the results of contractural studies of transport accident data undertaken in a joint research program sponsored by the FAA and NASA. From these accident data studies it was concluded that the greatest potential for improved transport crashworthiness is in the reduction of fire related fatalities. Accident data pertaining to fuselage integrity, main landing gear collapse, fuel tank rupture, wing breaks, tearing of tank lower surfaces, and engine pod scrubbing are discussed. In those accidents where the energy absorbing protective capability of the fuselage structure is expended and the airplane experiences major structural damage, trauma caused fatalities are also discussed. The dynamic performance of current seat/restraint systems are examined but it is concluded that the accident data does not adequately define the relationship between occupant response and the dynamic interaction with the seat, floor and fuselage structure. Author

N83-27981# Naval Air Development Center, Warminster, Pa. Aircraft and Crew Systems Technology Directorate.

HELICOPTER PERFORMANCE COMPUTER PROGRAMS Final Report

David Kobus and Steven Woods 30 Jan. 1982 115 p refs
(AD-A124603) Avail: NTIS HC A06/MF A01 CSCL 09/2

Document describes helicopter performance computer programs which are capable of analyzing the flight performance of typical helicopter configurations. Areas of flight performance include specific excess power, sustained and instantaneous turn rate, and maneuver capability. Performance output can be displayed graphically as well as numerically. These programs were written in FORTRAN and use three supporting subroutines. This report describes the analytical development and logic development for the programs. In addition, it includes a user description and complete listing. GRA

N83-27982# Dayton Univ., Ohio. Research Inst.

AUTOMATED DESIGN OF DAMAGE RESISTANT STRUCTURES. VOLUME 1: THEORY AND APPLICATION Final Report, 1 Jun. 1979 - 30 Apr. 1982

Ronald F. Taylor Wright-Patterson AFB, Ohio AFWAL Oct. 1982 147 p refs
(Contract F33615-79-C-3209; AF Proj. 2401)
(AD-A125731; AFWAL-TR-82-3087-Vol-1) Avail: NTIS HC A07/MF A01 CSCL 01/3

This report documents an effort to develop an optimality criterion approach to the design of damage tolerant structures subject to stress, deflection, and frequency requirements. Damage conditions are treated in an integral manner in the resizing algorithm. An iterative reanalysis procedure is used to improve the efficiency of the static analyses that are needed as the optimization proceeds. In this volume of the report, the theoretical development is given together with applications to representative structures. Detailed applications include the development of designs for a metal and a composite A7D outer wing panel. Volume 2 of the report gives user information on the computer program used in these applications. GRA

N83-27983# Dayton Univ., Ohio.

AUTOMATED DESIGN OF DAMAGE RESISTANT STRUCTURES. VOLUME 2: PROGRAM USER'S MANUAL Final Report, 1 Jun. 1979 - 30 Apr. 1982

Ronald F. Taylor Wright-Patterson AFB, Ohio AFWAL Oct. 1982 200 p refs
(Contract F33615-79-C-3209; AF Proj. 2401)
(AD-A125732; AFWAL-TR-82-3087-Vol-2) Avail: NTIS HC A09/MF A01 CSCL 01/3

This report documents an effort to develop an optimality criterion approach to the design of damage tolerant structures subject to stress, deflection, and frequency requirements. Damage conditions are treated in an integral manner in the resizing algorithm. An iterative reanalysis procedure is used to improve the efficiency of the static analyses that are needed as the optimization proceeds. In this volume of the report, input instructions to the computer code ADDRESS (Automated Design of the Damage Resistant Structures) are detailed. Further information is included which shows the required control card sequence, the program structures, and subroutine descriptions. The program is operational on the CDC CYBER system at Wright-Patterson Air Force Base. GRA

N83-27984# Naval Postgraduate School, Monterey, Calif.

EFFECTS OF WIND ON THE AIRCRAFT OPTIMUM CRUISE PERFORMANCE AND FLIGHT PERFORMANCE ADVISORY SYSTEMS FOR F-4E AND F-5E AIRCRAFT M.S. Thesis

Jaemyong Lee Jun. 1982 232 p refs
(AD-A125587; NPS67-82-006) Avail: NTIS HC A11/MF A01 CSCL 09/2

One of several fuel-saving operational concepts being investigated is the application of state-of-the-art hand-held calculators to serve as Flight Performance Advisory Systems (FPAS). The principal function of a FPAS is to advise the pilot, based on the aircraft drag configuration, and gross weight, of the optimum flight performance parameters such as altitude and airspeed. The research reported herein is the development of the mathematical relationships for the effects of the wind on the aircraft optimum cruise performance. This thesis also describes the operating procedure of a Hewlett-Packard HP-41CV hand-held calculator programmed to serve as an F-4E and F-5E Flight Performance Advisory System. The objective of the FPAS is to recommend optimal flight profiles to achieve maximum fuel conservation. Because of the constraints imposed by HP-41CV memory size, the F-4E FPAS is comprised of three programs, and the F-5E is comprised of a single program. GRA

N83-27985# Army Aviation Engineering Flight Activity, Edwards AFB, Calif.

FUEL CONSERVATION EVALUATION OF US ARMY HELICOPTERS. PART 3: UH-1H FLIGHT TESTING Final Report, Feb. - Mar. 1981

Fred Stellar, Donald I. Underwood, and Floyd Dominick Aug. 1982 84 p refs
(AD-A125667; USAAEFA-81-01-3) Avail: NTIS HC A05/MF A01 CSCL 21/4

The United States Army Aviation Engineering Flight Activity conducted level flight performance tests of the UH-1H helicopter to provide data to determine the most fuel efficient operating characteristics. Hot and cold weather test sites were used to extend the advancing tip Mach number data range to supplement existing YUH-1H performance data. Based on preliminary analysis, range can be increased significantly at optimum altitude and rotor speed compared to sea level and normal rotor speed (324 RPM). Rotor compressibility effects were significant at all test conditions. GRA

N83-27986# Georgia Inst. of Tech., Atlanta. Lab. for Electromagnetics.

FLIGHT AND SIMULATION TEST ANALYSIS SYSTEM Final Report, 8 Feb. - 31 Aug. 1982

R. N. Seitz Jan. 1983 42 p refs
(Contract DAAH01-81-D-A003)
(AD-A125614; AD-E950357; DRSMI/RD-CR-83-7; GIT/EES-A-3167-001) Avail: NTIS HC A03/MF A01 CSCL 09/2

The goal of this study was to propose an equipment configuration for the Flight and Simulation Test Analysis System based on potential users needs, and to conduct compatibility studies between various models of the proposed equipment. The Flight and Simulation Test Analysis System is intended to be a data analysis facility to improve engineering productivity by assimilating data from either flight tests or flight simulations and then analyzing and plotting the data for the engineering staff at interactive terminals. Author (GRA)

N83-27987# Army Aviation Engineering Flight Activity, Edwards AFB, Calif.
UH-60A LIGHT ICING ENVELOPE EVALUATION WITH THE BLADE DEICING KIT INSTALLED BUT INOPERATIVE Final Report, 29 Jan. - 1 Apr. 1982
Robert D. Robbins and Vernon I. Diekmann Jun. 1982 59 p refs
(AD-A125630; USAAEFA-81-18) Avail: NTIS HC A04/MF A01 CSCL 01/3

Artificial and natural icing flight tests were conducted on the UH-60A Black Hawk helicopter to verify the existence of a light icing envelope. Testing consisted of 9.0 productive flight hours in the icing environment. The aircraft handling qualities and vibration levels were acceptable throughout the limited artificial and natural icing conditions tested. The UH-60A demonstrated safe operation in light icing conditions up to and including 0.3 gm/m3 LWC without operating the blade deice system. However, the potential for aircraft damage exists in icing conditions greater than 0.3 gm/m3. Three deficiencies were identified including aircraft damage from rotor system ice sheds, improper droop stop positions during shutdown, and failure of the blade deice electrical protection system to protect the blades against a heater element short circuit. GRA

06 AIRCRAFT INSTRUMENTATION

Includes cockpit and cabin display devices; and flight instruments.

For related information see also *19 Spacecraft Instrumentation* and *35 Instrumentation and Photography.*

N83-27988 Royal Aircraft Establishment, Farnborough (England).
THE DESIGN OF SHIELDED PITOT TUBES WITH SMALL SENSITIVITY TO INCIDENCE
A. R. G. Mundell 29 Nov. 1982 19 p refs
(RAE-TM-AERO-1863; BR86355) Copyright. Avail: Issuing Activity

The range of incidence over which a pitot-tube accurately indicates stagnation pressure in subsonic flow was increased by surrounding the pitot with a carefully designed shield. The effect of some of the design variables of this shield are investigated experimentally, and a miniature probe design is described which enables an accurate indication of stagnation pressure to be obtained over an incidence range of 57 deg. Author (ESA)

N83-27989*# Old Dominion Univ., Norfolk, Va. Dept. of Mechanical Engineering and Mechanics.
EXPERIMENTAL AND ANALYTICAL STUDIES OF A TRUE AIRSPEED SENSOR Final Report
G. L. Goglia and J. Y. Shen May 1983 173 p refs
(Grant NsG-1177)
(NASA-CR-165704; NAS 1.26:165704) Avail: NTIS HC A08/MF A01 CSCL 01D

A true airspeed sensor based on the precession of a vortex whistle for sensing airspeeds up to 321.9 km/hr (200 mph). In an attempt to model the complicated fluid mechanics of the vortex precession, three dimensional, inviscid, unsteady, incompressible fluid flow was studied by using the hydrodynamical linearized stability theory. The temporal stability approach was used to derive the relationship between the true airspeed and frequency response. The results show that the frequency response is linearly proportional to the airspeed. A computer program was developed to obtain the numerical solution. Computational results for various parameters were obtained. The designed sensor basically consisted of a vortex tube, a swirler, and a transducer system. A microphone converted the audible tone to an electronic frequency signal. Measurements for both the closed conduit tests and wind tunnel tests were recorded. For a specific flow rate or airspeed, larger exit swirler angles produced higher frequencies. For a smaller cross sectional area in the precessional flow region, the frequency was higher. It was observed that as the airspeed was increased the Strouhal number remained constant. S.L.

N83-27990# ITT Electro-Optical Products Div., Roanoke, Va.
A STUDY OF WAVELENGTH DIVISION MULTIPLEXING FOR AVIONICS APPLICATIONS Final Technical Report, 15 Jun. 1981 - 16 Aug. 1982
J. C. Williams, D. Porter, T. Leonard, S. Goodman, and D. Huber Wright-Patterson AFB, Ohio AFWAL Aug. 1982 219 p refs
(Contract F33615-81-C-1481; AF Proj. 2003)
(AD-A125749; ITT-83-32-02; AFWAL-TR-82-1116) Avail: NTIS HC A10/MF A01 CSCL 09/3

The performance of avionics wavelength division multiplexed (WDM) fiber optic systems was analyzed using an Optical Circuit Analysis Program (OCAP) developed during the study. Design solutions were found for several sets of Air Force avionics information transfer specifications, and sensitivity analysis techniques using OCAP were used to show that the solutions were reliable. Recommendations were made on key component developments which could result in major advancements in WDM system design. These developments would include diffraction grating WDM couplers, high speed-high power light emitting diodes, and pin-FET receivers. Quantitative analysis of an avionics WDM system using these components indicates performance beyond that previously thought possible. Three specified Air Force WDM avionics systems were designed which could be fabricated using technology available in the 1983-1985 time frame. A design for a WDM demonstration system was developed which allows WDM systems to be demonstrated and WDM components to be tested. The WDM demonstration system was designed for laboratory bench applications and features a modular organization to provide for maximum user flexibility. Examples are given of the use of the WDM demonstration system for measurements of system performance parameters such as bit error rate, link delay, optical dynamic range, and rise time, and recommendations are made on key future component developments which could enhance avionic WDM systems. Author (GRA)

07 AIRCRAFT PROPULSION AND POWER

Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; and on-board auxiliary power plants for aircraft.

For related information see also *20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *44 Energy Production and Conversion.*

N83-27991*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
A SURVEY OF INLET/ENGINE DISTORTION COMPATIBILITY
David N. Bowditch and Robert E. Coltrin 1983 22 p refs
Presented at the 19th Joint Propulsion Conf., Seattle, 27-29 Jun. 1983; sponsored by AIAA, SAE and ASME
(NASA-TM-83421; E-1711; NAS 1.15:83421) Avail: NTIS HC A02/MF A01 CSCL 21E

The history of distortion analysis is traced back to its origin in parallel compressor theory which was initially proposed in the late fifties. The development of this theory is reviewed up to its inclusion in the complex computer codes of today. It is found to be a very useful tool to guide development but not quantitative enough to predict compatibility. Dynamic or instantaneous distortion methodology is also reviewed from its origins in the sixties, to its current application in the eighties. Many of the requirements for interpreting instantaneous distortion are considered and illustrated. Statistical methods for predicting the peak distortion are described, and their limitations and advantages discussed. Finally, some Reynolds number and scaling considerations for inlet testing are considered. It is concluded that the deterministic instantaneous distortion methodology combined with distortion testing of engines with screens will remain the primary method of predicting compatibility

for the near future. However, parallel compressor analysis and statistical peak distortion prediction will be important tools employed during the development of inlet/engine compatibility. Author

N83-27992*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
LOW SPEED PERFORMANCE OF A SUPERSONIC AXISYMMETRIC MIXED COMPRESSION INLET WITH AUXILIARY INLETS
Joseph F. Wasserbauer, Robert W. Cubbison, and Charles J. Trefny 1983 32 p refs Presented at the 19th Joint Propulsion Conf., Seattle, 27-29 Jun. 1983; sponsored by AIAA, SAE and ASME
(NASA-TM-83435; E-1730; NAS 1.15:83435) Avail: NTIS HC A03/MF A01 CSCL 21E

The aerodynamic performance of a representative supersonic cruise inlet was investigated using a fan simulator coupled to the inlet to provide characteristic noise signatures and to pump the inlet flow. Data were obtained at Mach numbers from 0 to 0.2 for the inlet equipped with an auxiliary inlet system that provided 20 to 40 percent of the fan flow. Results show that inlet performance improved when the inlet bleed systems were sealed; when the freestream Mach number was increased; and when the auxiliary inlets were opened. The inlet flow could not be choked by either centerbody translation or by increasing the fan speed when the 40 percent auxiliary inlet was incorporated. A.R.H.

N83-27993*# Pratt and Whitney Aircraft Group, East Hartford, Conn. Commercial Products Div.
JT9D THERMAL BARRIER COATED VANES
K. D. Sheffler, R. A. Graziani, and G. C. Sinko Apr. 1982 171 p refs
(Contract NAS3-20630)
(NASA-CR-167964; NAS 1.26:167964; PWA-5515-176) Avail: NTIS HC A08/MF A01 CSCL 21E

The technology of plasma sprayed thermal barrier coatings applied to turbine vane platforms in modern high temperature commercial engines was advanced to the point of demonstrated feasibility for application to commercial aircraft engines. The three thermal barrier coatings refined under this program are zirconia stabilized with twenty-one percent magnesia (21% MSZ), six percent yttria (6% YSZ), and twenty percent yttria (20% YSZ). Improvement in thermal cyclic endurance by a factor of 40 times was demonstrated in rig tests. A cooling system evolved during the program which featured air impingement cooling for the vane platforms rather than film cooling. The impingement cooling system, in combination with the thermal barrier coatings, reduced platform cooling air requirements by 44% relative to the current film cooling system. Improved durability and reduced cooling air requirements were demonstrated in rig and engine endurance tests. Two engine tests were conducted, one of 1000 cycles and the other of 1500 cycles. All three coatings applied to vanes fabricated with the final cooling system configuration completed the final 1500 cycle engine endurance test. Results of this test clearly demonstrated the durability of the 6% YSZ coating which was in very good condition after the test. The 21% MSZ and 20% YSZ coatings had numerous occurrences of significant spalling in the test. Author

N83-27994*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ADVANTAGE OF RESONANT POWER CONVERSION IN AEROSPACE APPLICATIONS
Irving G. Hansen May 1983 8 p refs
(NASA-TM-83399; E-1676; NAS 1.15:83399) Avail: NTIS HC A02/MF A01 CSCL 21E

An ultrasonic, sinusoidal aerospace power distribution system is shown to have many advantages over other candidate power systems. These advantages include light weight, ease of fault clearing, versatility in handling many loads including motors, and the capability of production within the limits of present technology. References are cited that demonstrate the state of resonant converter technology and support these conclusions. Author

N83-27995*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
A VARIABLE-GEOMETRY COMBUSTOR USED TO STUDY PRIMARY AND SECONDARY ZONE STOICHIOMETRY
Daniel Briehl, Donald F. Schultz, and Robert C. Ehlers 1983 15 p refs Proposed for presentation at the Joint Power Generation Conf., Indianapolis, 25-29 Sep. 1983; sponsored by ASME
(NASA-TM-83372; E-1640; NAS 1.15:83372) Avail: NTIS HC A02/MF A01 CSCL 21E

A combustion program is underway to evaluate fuel quality effects on gas turbine combustors. A rich-lean variable geometry combustor design was chosen to evaluate fuel quality effects over a wide range of primary and secondary zone equivalence ratios at simulated engine operating conditions. The first task of this effort, was to evaluate the performance of the variable geometry combustor. The combustor incorporates three stations of variable geometry to control primary and secondary zone equivalence ratio and overall pressure loss. Geometry changes could be made while a test was in progress through the use of remote control actuators. The primary zone liner was water cooled to eliminate the concern of liner durability. Emissions and performance data were obtained at simulated engine conditions of 80 percent and full power. Inlet air temperature varied from 611 to 665K, inlet total pressure varied from 1.02 to 1.24 MPa, reference velocity was a constant 1400 K. Author

N83-27996*# Detroit Diesel Allison, Indianapolis, Ind.
ROTORCRAFT CONVERTIBLE ENGINE STUDY Final Report, 11 Dec. 1980 - 31 Mar. 1982
J. C. Gill, R. V. Earle, and H. M. Mar Sep. 1982 114 p refs
(Contract NAS3-22742)
(NASA-CR-168161; NAS 1.26:168161; DDA-EDR-10978) Avail: NTIS HC A06/MF A01 CSCL 21E

The objective of the Rotorcraft Convertible Engine Study was to define future research and technology effort required for commercial development by 1988 of convertible fan/shaft gas turbine engines for unconventional rotorcraft transports. Two rotorcraft and their respective missions were defined: a Fold Tilt Rotor aircraft and an Advancing Blade Concept (ABC) rotorcraft. Sensitivity studies were conducted with these rotorcraft to determine parametrically the influence of propulsion characteristics on aircraft size, mission fuel requirements, and direct operating costs (DOC). The two rotorcraft were flown with conventional propulsion systems (separate lift/cruise engines) and with convertible propulsion systems to determine the benefits to be derived from convertible engines. Trade-off studies were conducted to determine the optimum engine cycle and staging arrangement for a convertible engine. Advanced technology options applicable to convertible engines were studied. Research and technology programs were identified which would ensure technology readiness for commercial development of convertible engines by 1988.
Author

08 AIRCRAFT STABILITY AND CONTROL

Includes aircraft handling qualities; piloting; flight controls; and autopilots.

N83-27997 Princeton Univ., N. J.
LONGITUDINAL FLYING QUALITIES CRITERIA FOR SINGLE PILOT INSTRUMENT FLIGHT OPERATIONS Ph.D. Thesis
Aharon Bar-Gill 1982 253 p
Avail: Univ. Microfilms Order No. DA8228170

This research used modern estimation and control theory flight testing, and statistical analysis to deduce flying qualities criteria for General Aviation (GA) Single Pilot Instrument Flight Rule (SPIFR) operations. Unsatisfactory aircraft dynamic response combined with high navigation/communication workload can produce problems of safety and efficiency. First, the relative importance of these factors was determined by flying SPIFR tasks

with different aircraft dynamic configurations and assessing the effects of such variations. The experimental results yielded quantitative indicators of pilot's performance and workload, and for each of them, multivariate regression was applied to evaluate several candidate flying qualities criteria. Aircraft configurations that are representative of the low frequency dynamic and trim related airframe response, and whose ranges of variation cover both the existing light aircraft fleet and recent trends in GA design, were tested. Dissert. Abstr.

N83-27998*# Hydraulic Research Textron, Valencia, Calif.
APPLICATION OF ACTIVE CONTROL LANDING GEAR TECHNOLOGY TO THE A-10 AIRCRAFT Final Report
Irving Ross and Ralph Edson Jun. 1983 130 p refs
(Contracts NAS1-17068; NAS1-14459; NAS1-16420)
(NASA-CR-166104; NAS 1.26:166104) Avail: NTIS HC A07/MF A01 CSCL 01C

Two concepts which reduce the A-10 aircraft's wing/gear interface forces as a result of applying active control technology to the main landing gear are described. In the first concept, referred to as the alternate concept a servovalve in a closed pressure control loop configuration effectively varies the size of the third stage spool valve orifice which is embedded in the strut. This action allows the internal energy in the strut to shunt hydraulic flow around the metering orifice. The command signal to the loop is reference strut pressure which is compared to the measured strut pressure, the difference being the loop error. Thus, the loop effectively varies the spool valve orifice size to maintain the strut pressure, and therefore minimizes the wing/gear interface force referenced. S.L.

N83-27999# Naval Test Pilot School, Patuxent River, Md.
FIXED WING STABILITY AND CONTROL THEORY AND FLIGHT TEST TECHNIQUES. REVISION
1 Nov. 1981 669 p
(AD-A124610; USNTPS-FTM-103-Rev) Avail: NTIS HC A99/MF A01 CSCL 01/2

This manual is primarily a guide for pilots and engineers attending the U.S. Naval Test Pilot School. The text presents basic fixed wing stability and control theory, qualitative and quantitative test and evaluation techniques, and data presentation methods. In most sections, more than one technique is described for each test. Generally, the best technique for a particular investigation will depend on the purpose of the investigation, the amount of instrumentation available and the personal preference of the individual test pilot. The approach of the qualitative stability and control testing presented herein is an attempt to associate all flying qualities tests with particular pilot tasks required in the performance of the total mission of the airplane. The pilot's opinion of a particular flying quality will consequently depend primarily on the pilot workload while performing the desired task. Quantitative evaluation techniques presented may be used to substantiate pilot opinion or gather data for documentation of airplane characteristics. The performance of both qualitative testing and quantitative evaluation is considered essential for any successful flying qualities investigation. GRA

N83-28000# Naval Postgraduate School, Monterey, Calif.
CALCULATION OF THE LONGITUDINAL STABILITY DERIVATIVES AND MODES OF MOTION FOR HELICOPTER AIRCRAFT M.S. Thesis
Hugh James ONeill Oct. 1982 114 p refs
(AD-A125593) Avail: NTIS HC A06/MF A01 CSCL 01/3

This thesis presents an analysis of the longitudinal stability derivatives for helicopter aircraft and is intended to be used as a resource document for a helicopter stability and control course at the Naval Postgraduate School. Emphasis is given to the evolution of forces and moments on the helicopter, calculation of the stability derivatives at high advance ratios, derivation of the stability determinant and solution of the characteristic equation to yield the modes of motion of the helicopter. Author (GRA)

N83-28001# European Space Agency, Paris (France).
AN OBSERVER APPROACH TO THE IDENTIFICATION AND ISOLATION OF SENSOR FAILURES IN FLIGHT CONTROL SYSTEMS
Norbert Stuckenberg Dec. 1982 164 p refs Transl. into ENGLISH of "Ein Beitrag zur Erkennung und Isolation von Sensorfehlern in Flugregelsystemen unter Verwendung von Beobachtern" rept. DFVLR-FB-81-26 DFVLR, Brunswick, Jul. 1981
(ESA-TT-738; DFVLR-FB-81-26) Avail: NTIS HC A08/MF A01; original German version available from DFVLR, Cologne DM 32

A reliability concept for flight control sensors which provides a duplex sensor configuration with fail-operational capabilities by using analytical redundancy with deterministic observers is presented. Without disregarding disturbances and plant parameter variations, the detection performance was evaluated with respect to the failure signal properties. The concept was applied to a command and stability augmentation system for the lateral motion of the HFB 320 aircraft. Author (ESA)

N83-28002# Technische Hogeschool, Delft (Netherlands). Dept. of Aerospace Engineering.
OUTPUT FEEDBACK REGULATORS FOR AIRCRAFT AUTOMATIC CONTROL SYSTEMS
P. Wilbers and J. A. Hoogstraten Apr. 1983 51 p refs
(VTH-LR-339) Avail: NTIS HC A04/MF A01

A design method for linear proportional and linear dynamic output feedback regulators for discrete time systems is presented. The system to be controlled is represented by a linear model. The performance criterion is given in the form of a quadratic cost function, weighing the deviations from their reference values of the control input signals, and of the controlled variables (represented as linear combinations of state and input variables) which define the control task. It is shown that the necessary conditions for minimization of the chosen cost function, when employing an output feedback gain matrix, are given by a set of three recurrent relations. Solution of this set of equations yields the elements of the feedback gain matrix. This result is extended to encompass the design of a dynamic output feedback regulator. Design of a transport aircraft altitude regulator is outlined.
Author (ESA)

N83-28003# Technische Hogeschool, Delft (Netherlands). Dept. of Aerospace Engineering.
IDENTIFICATION OF PRIMARY FLIGHT CONTROL SYSTEM CHARACTERISTICS FROM DYNAMIC MEASUREMENTS
J. G. denHollander Nov. 1982 79 p refs
(VTH-LR-348) Avail: NTIS HC A05/MF A01

A method which formulates an a priori mathematical model of the primary flight control system is presented. The model is formulated in a format directly applicable to the analysis of in flight measurements of the motion of the control system relative to the moving aircraft. The model parameters relating the linear and nonlinear model characteristics are extracted from the measurements using multiple regression analysis. Since not all required time varying data can be measured equally well in flight, a separate state reconstruction is performed prior to the regression analysis, by an extended Kalman filtering and smoothing algorithm. Data analysis consists of reconstruction of the state of the aircraft, reconstruction of the state of the control system relative to the aircraft and parameter identification by regression analysis.
Author (ESA)

09 RESEARCH AND SUPPORT FACILITIES (AIR)

Includes airports, hangars and runways; aircraft repair and overhaul facilities; wind tunnels; shock tube facilities; and engine test blocks.

For related information see also *14 Ground Support Systems and Facilities (Space).*

N83-28004# Office National d'Etudes et de Recherches Aerospatiales, Toulouse (France). Aerothermodynamics Dept.

STUDIES ON THE CRYOGENIC INDUCTION DRIVEN WIND-TUNNEL T2
J. L. Gobert and A. Mignosi 1982 19 p refs Presented at the ETW Cryogenic Technol. Rev. Meeting, Amsterdam, 15-17 Sep. 1982
Avail: NTIS HC A02/MF A01

The transonic induction driven wind-tunnel T2, with a testing section of 38 x 40 square cm pressurized up to 6 bars was transformed into a cryogenic system in 1981. The airflow cooling is provided by a parietal injection of liquid nitrogen in the wind-tunnel. An internal insulation preserves most of the tunnel elements and works with runs which last until one minute. The method used for the run starting and the automatic control of the airflow parameters is described. A simplified process model allows a mini-computer centralizing all useful data to generate in real time the commands to initate and stabilize the desired temperature and pressure values. The results defining the installation performances and airflow qualities are presented. B.G.

N83-28005# Federal Aviation Administration, Washington, D.C.
ADVISORY CIRCULAR. AIRPORT DESIGN STANDARDS: TRANSPORT AIRPORTS
28 Feb. 1983 85 p
(FAA-AC-150/5300-12) Avail: NTIS HC A05/MF A01

Airport geometry, runway design, taxiway design, surface gradient and line-of-sight, the effects of treatment of jet blast, runway and taxiway bridges, taxiway design rationale, and taxiway fillet design are discussed. Author

N83-28006*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
MAN-VEHICLE SYSTEMS RESEARCH FACILITY: DESIGN AND OPERATING CHARACTERISTICS
May 1983 17 p
(NASA-TM-84372; A-9371; NAS 1.15:84372) Avail: NTIS HC A02/MF A01 CSCL 14B

The Man-Vehicle Systems Research Facility (MVSRF) provides the capability of simulating aircraft (two with full crews), en route and terminal air traffic control and aircrew interactions, and advanced cockpit (1995) display representative of future generations of aircraft, all within the full mission context. The characteristics of this facility derive from research, addressing critical human factors issues that pertain to: (1) information requirements for the utilization and integration of advanced electronic display systems, (2) the interaction and distribution of responsibilities between aircrews and ground controllers, and (3) the automation of aircrew functions. This research has emphasized the need for high fidelity in simulations and for the capability to conduct full mission simulations of relevant aircraft operations. This report briefly describes the MVSRF design and operating characteristics. S.L.

N83-28007# Materials Research Labs., Ascot Vale (Australia).
ELECTRICAL RESISTANCE TESTING OF ANTISTATIC BENCH AND FLOOR SURFACE MATERIAL AFTER LAYING
Michael G. Wolfson and Kenneth J. Lee Aug. 1982 56 p refs
(AD-A125423; MRL-TN-466; AR-003047) Avail: NTIS HC A04/MF A01 CSCL 14/2

Large areas of floors and benchtops in the laboratories of the Explosives and Ammunition Composite at Materials Research Laboratories are covered with an antistatic material. Electrical resistance testing of this material afer laying is reported. Testing was carried out in accordance with BS 2050:1961 and BS 3398:1961. Author (GRA)

N83-28008# New Mexico Univ., Albuquerque. Engineering Research Inst.
SOFT AIRFIELD TEST WITH F-4 AIRCRAFT Final Report, May - Sep. 1981
Vince Cassino Tyndall AFB, Fla. Air Force Energy and Service Center Dec. 1981 99 p
(Contract F29601-81-C-0013; AF Proj. 2621)
(AD-A125393; NMERI-TA5-4; AFFSC/ESL-TR-82-18) Avail: NTIS HC A05/MF A01 CSCL 08/13

Tests were conducted to investigate the interaction of soil surfaces with the landing gear of F-4E aircraft to validate computer prediction routines. Site selection and soil tests are described. In-place soil tests were conducted, and aircraft ground performance was measured during towed and powered taxi operations. Soil strength was adequate to support the aircraft for the two loadings used. Laboratory tests were performed to further identify the soil strength parameters. Aircraft location while operating on the test area was determined by a ground survey system and a laser tracking system. Author (GRA)

N83-28009# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
DESIGN AND EVALUATION OF CASCADE TEST FACILITY M.S. Thesis
Dennis M. Allison Jun. 1982 67 p refs
(AD-A125622; AFIT/GAE/AA/81D-2) Avail: NTIS HC A04/MF A01 CSCL 20/4

A cascade test facility was designed and built. The facility delivers 4.0 lbm/sec of air to the test section with turbulence intensities of 2.1 percent. The maximum Reynolds number attainable is 3.24 x 10 to the 6th power per foot. The velocity and turbulence intensity profiles in the flow stream behind the blades were investigated with a hot film anemometer. The fluid turning angle was 30 degrees. The profiles were obtained at 5, 2, and 4 chord lengths downstream from the trailing edges of Reynolds numbers of 2.34, 2.83, and 2.97 million per foot. The profiles behind the three center blades of the five blade cascade were very closely matched in all tests cases. One major problem in the design, a flow tuning adjustment in the test section, requires redesign; otherwise, the facility is adequate for the testing of compressor and turbine cascades. Author (GRA)

N83-28010# Franklin Research Center, Philadelphia, Pa.
COMPUTER CONTROL AND ACTIVATION OF SIX-DEGREE-OF-FREEDOM SIMULATOR Final Report
Edward G. Davies, Richard Chou, John Stone, KaCheung Tsui, and Maurice Z. Darwish Jan. 1983 417 p
(Contract DAAF03-73-C-0142)
(AD-A126126; AD-E400962; ARTSD-SP-81001) Avail: NTIS HC A18/MF A01 CSCL 17/7

Following the acquisition of a passive multi-degree-of-freedom simulator by the Ware Simulation Section, Rock Island Arsenal, Rock Island, IL, the Franklin Research Center was contracted to design and to make the necessary modifications for conversion from a passive to an activated simulator. This report outlines and details the design philosophy used for providing programmable motions, vibrations, and spring rates required for activating the passive simulator. This report also documents the changes required in the hydraulic power supply, the mechanical changes to the yaw and pitch gimbals, and the electronic changes to the spring rate controller. GRA

12 ASTRONAUTICS (GENERAL)

For extraterrestrial exploration see *91 Lunar and Planetary Exploration.*

N83-28011# Joint Publications Research Service, Arlington, Va.
USSR REPORT: SPACE, NO. 21
9 May 1983 147 p refs Transl. into ENGLISH from various Russian articles
(JPRS-83430) Avail: NTIS HC A07

Several areas of space science and technology are addressed including: manned mission highlights, interplanetary sciences, space engineering, space applications, and space policy and administration. For individual titles, see N83-28012 through N83-28024.

N83-28012# Joint Publications Research Service, Arlington, Va.
LEONOV DESCRIBES COSMONAUTS' LANDING, PHYSICAL CONDITION **c52**
B. Konovalov *In its* USSR Rept.: Space, No. 21 (JPRS-83430) 9 May 1983 p 1-3 refs Transl. into ENGLISH from Nedelya (Moscow), no. 50, 13-19 Dec. 1982 p 5 (For primary document see N83-28011 17-12)
Avail: NTIS HC A07

An overview and assessment of the post flight conditions of cosmonauts Anatoliy Berezovoy and Valentin Lebedev was presented. B.G.

N83-28013# Joint Publications Research Service, Arlington, Va.
SALYUT-7 COSMONAUTS' PRESS CONFERENCE
In its USSR Rept.: Space, No. 21 (JPRS-83430) 9 May 1983 p 4-11 Transl. into ENGLISH of 0755 GMT Moscow Domestic Service, 6 Jan. 1983 (For primary document see N83-28011 17-12)
Avail: NTIS HC A07

Post-flight press conference for the Salyut 7 crew. Areas of discussion included Earth observation from space, medical-biological aspects of long duration space flight, space manufacturing, agricultural crops, and checkout of new instruments. B.G.

N83-28014# Joint Publications Research Service, Arlington, Va.
KORUND CRYSTAL PRODUCTION UNIT ON SALYUT-7
V. Zubkov *In its* USSR Rept.: Space, No. 21 (JPRS-83430) 9 May 1983 p 12-14 Transl. into ENGLISH from Sots. Industriya (Moscow), 7 Dec. 1982 p 4 (For primary document see N83-28011 17-12)
Avail: NTIS HC A07

The technological experiments carried out in space make it possible to come to a closer clarification of the nature of crystal growth, the mechanism of the transpiring processes, and the perfecting schemes for technological processes for obtaining different compounds. Samples of indium antimonide and cadmium selenide were obtained with the 'Korund'. Author

N83-28015# Joint Publications Research Service, Arlington, Va.
SPACE PHYSICS STUDIED IN INTERCOSMOS PROGRAM **c70**
V. M. Balebanov and A. V. Zakharov *In its* USSR Rept.: Space, No. 21 (JPRS-83430) 9 May 1983 p 20-29 Transl. into ENGLISH from Zemlya i Vselennaya (Moscow), no. 2, Mar. - Apr. 1982 p 15-20 (For primary document see N83-28011 17-12)
Avail: NTIS HC A07

The manned flights under the "Intercosmos" program became a logical continuation of the program which was begun at the end of the 1960's. The primary areas in which experiments were conducted were the physical processes in the ionosphere, the Earth's magnetosphere, and interplanetary space, the Sun and solar activity, and cosmic radiation. The insertion of a measuring probe into a medium, the properties of which are studied is one of the basic methods of research in the field of space physics. There are physical phenomena which cannot be investigated, using only small automatic satellites. These include radiation from distant astronomical objects in a wide range of wavelengths and the high energy component of galactic cosmic radiation. Either multiton automatic units or manned spacecraft are inserted into orbit. In order subsequently to create the optimal automatic instrument, it is desirable to thrust man with the performance of the first experiments. The study of optical phenomena in the upper atmosphere-the polar auroras, the middle latitudinal red arcs and equatorial glow-played a significant role in the manned part of the 'Intercosmos' program. Author

N83-28016# Joint Publications Research Service, Arlington, Va.
EARTH'S NATURAL RESOURCES IN MANNED FLIGHTS OF INTERCOSMOS PROGRAM **c43**
V. V. Arkhipov *In its* USSR Rept.: Space, No. 21 (JPRS-83430) 9 May 1983 p 30-36 Transl. into ENGLISH from Zemlya i Vselennaya (Moscow), no. 2, Mar. - Apr. 1982 p 20-28 (For primary document see N83-28011 17-12)
Avail: NTIS HC A07

One of the main areas of manned flights under the 'Intercosmos', program was, of course, the study of the natural resources of the earth. The reasons were as followed. Further development of the national economy it is important to estimate the possible climate fluctuations, improve the accuracy of weather forecasts, predict earthquakes and optimize the ground communication routes. The structure of the minerals of the region, and discovery of new areas prospective for mineral prospecting is more precisely determined. If we know the dynamics of the atmosphere and ocean and the structure of the mineral resources, then probably we shall be able to discover new sources of natural resources. Similarity of the elements of the geological structure of Mars and the Earth is of unconditional interest. Mars has gigantic faults running thousands of kilometers analogous to earth's faults, and it has shield volcanoes like the highest point of Tibesti Mountain in Africa, the extinct Emi-Kusi Volcano 3415 meters high. Author

N83-28017# Joint Publications Research Service, Arlington, Va.
PRODUCTION IN OUTER SPACE IN INTERCOSMOS PROGRAM
S. D. Grishin and V. V. Savichev *In its* USSR Rept.: Space, No. 21 (JPRS-83430) 9 May 1983 p 37-44 Transl. into ENGLISH from Zemlya i Vselennaya (Moscow), no. 2, Mar. - Apr. 1982 p 28-32 (For primary document see N83-28011 17-12)
Avail: NTIS HC A07

Four experiments were performed with different eutectic compositions and optical materials. In contrast to Earth analogs, the samples obtained on board the station turned out to be more homogeneous. The hardening of two ion compounds forming a eutectic (lead chloride and copper chloride) when one of the compounds (lead chloride) is present in excess was studied on the 'Splav' device. For this purpose a mixture of ground single crystals was charged in an evacuated quartz ampule 8 mm in diameter and 50 mm long. The ampule was heated for several hours to a temperature of 500 C, it was held for about 20 hours and then cooled with a temperature gradient of 40 degrees/cm at a rate of 10 degrees/hour. The product of the experiment was filamentary crystals of eutectic composition 2 to 3 microns in diameter. The lead chloride crystals are larger and more perfect than those obtained on the Earth, the component distribution in them is quite homogeneous. The form of the ingots differed from ideal-deformation is visible, and one sample had a helical surface, which obviously was connected with the operation of the station gear when the eutectic was grow... Author

N83-28018# Joint Publications Research Service, Arlington, Va.
SPACE BIOLOGY AND MEDICINE IN INTERCOSMOS PROGRAM **c52**
Ye. I. Vorobyev and A. R. Kotovskaya *In its* USSR Rept.: Space, No. 21 (JPRS-83430) 9 May 1983 p 45-51 Transl. into ENGLISH from Zemlya i Vselennaya (Moscow), no. 2, Mar. - Apr. 1982 p 32-35 (For primary document see N83-28011 17-12)
Avail: NTIS HC A07

The results of the performed studies indicate that no serious psychological problems arose. This stability was achieved by understanding the motivations for activity, the effectiveness of psychological selection, satisfactory living conditions, a balanced work and rest regime, and also special measures with respect to psychological support. The probability of development and the symptoms of disorders connected with the acute period of adaptation of man to weightlessness, estimation of the psychological characteristics of fitness and estimation of certain methods and means of unfavorable influences of weightlessness were determined. Author

N83-28019# Joint Publications Research Service, Arlington, Va.
VENERA-13 MASS SPECTROMETER STUDIES OF ATMOSPHERIC GASES ON VENUS **c91**
V. G. Istomin *In its* USSR Rept.: Space, No. 21 (JPRS-83430) 9 May 1983 p 56-65 refs Transl. into ENGLISH from Zemlya i Vselennaya (Moscow), no. 5, Sep. - Oct. 1982 p 19-25 (For primary document see N83-28011 17-12)
Avail: NTIS HC A07

Early in the morning of 1 March 1982, the descent vehicle of

the Venera 13 station entered the dense layers of the planet's atmosphere. At an altitude of about 23 km above the surface of Venus, a mass spectrometer was turned on. The mass spectra being received was identified peaks of isotopes of neon-20 and neon-22. This information, received within less than 15 minutes after the instrument was turned on meant the isotopic composition of neon (one of the rare gases) was present in negligible amounts in the atmosphere of the planet that is our closest neighbor.
Author

N83-28020# Joint Publications Research Service, Arlington, Va.
ACADEMICIAN TROITSKIY ON SEARCH FOR EXTRA-TERRESTRIAL INTELLIGENCE c55
In its USSR Rept.: Space, No. 21 (JPRS-83430) 9 May 1983 p 74-77 refs Transl. into ENGLISH from Leningr. Pravda (Leningrad), 2 Nov. 1982 p 3 (For primary document see N83-28011 17-12)
Avail: NTIS HC A07

The topic of extraterrestrial life was discussed with emphasis on the following areas: lack of signals from alien space civilizations, need of larger receiving antennas, their technological development, and the speed of signal dissemination. B.G.

N83-28021# Joint Publications Research Service, Arlington, Va.
SPACE PROPULSION UNITS OF FUTURE c20
Aleksandr Sergeyevich Dmitriyev and Vladimir Alekseyevich Koshelev *In its* USSR Rept.: Space, No. 21 (JPRS-83430) 9 May 1983 p 78-100 Transl. into ENGLISH from Kosmich. Dvigateli Budushchego (Novoye v Zhizni, Nauke, Tekhn.: Ser., Kosmonavtika, Astronomiya (Moscow), no. 3, Mar. 1982 p 2-31 and 64 (For primary document see N83-28011 17-12)
Avail: NTIS HC A07

Possible directions in the development of the space propulsion systems of tomorrow are examined. A number of traditional and new ideas and plane concerned with space propulsion units, their potentials, external energy sources, and engines using external sources of mass are described. Author

N83-28022# Joint Publications Research Service, Arlington, Va.
COMMENTARY ON ECONOMIC BENEFITS FROM SPACE PROGRAM c83
I. Isachenko *In its* USSR Rept.: Space, No. 21 (JPRS-83430) 9 May 1983 p 105-111 Transl. into ENGLISH from Ekon. Gazeta (Moscow), no. 39, Sep. 1982 p 21 (For primary document see N83-28011 17-12)
Avail: NTIS HC A07

There was a time when people asked the question: What is the practical value of space exploration? Now, the question does not arise. Astronomy, weather service, medicine, biology, agriculture, metallurgy and many other spheres of application need the data that can only be obtained in space orbits. The outlays for space are beginning to be repaid with interest. The development and practical use of new hardware for economic purposes is a major result of the activity on space exploration and development. Author

N83-28023# Joint Publications Research Service, Arlington, Va.
AEROSPACE PHOTOGRAPHY IN THE SERVICE OF GEOLOGY c35
V. Volkov *In its* USSR Rept.: Space, No. 21 (JPRS-83430) 9 May 1983 p 112-116 Transl. into ENGLISH from Tekhn. i Vooruzheniye (Moscow), no. 4, Apr. 1982 p 2-3 (For primary document see N83-28011 17-12)
Avail: NTIS HC A07

Among the methods of studying the geological structure of the earth and its mineral and raw material resources, aerospace photography presently occupies one of the leading places. Using sensing equipment installed aboard spacecraft and airplanes (photographic, photoscanning, television, radiometric etc.), large geological bodies and structures are studied, and their relationships in space analyzed. The information helps to establish the laws of mineral distribution and reveal areas in which new mineral deposits might be discovered. By subjecting high altitude and space photography to geological analysis, information on the structure and composition of not only deposits nears the surface but also rock lying much deeper down are obtained. Author

N83-28024# Joint Publications Research Service, Arlington, Va.
METEOR WEATHER SATELLITES c15
N. Konkov *In its* USSR Rept.: Space, No. 21 (JPRS-83430) 9 May 1983 p 117-120 Transl. into ENGLISH from Aviats. i Kosmonavtika (Moscow), no. 11, Nov. 1982 p 44-45 (For primary document see N83-28011 17-12)
Avail: NTIS HC A07

In order to formulate a reliable weather forecast, it is necessary to have operational information about the state of the entire layer of atmosphere, the ocean and the Earth's surface. It is possible to predict weather several days in advance if there is information available about meteorological processes taking place over at least half the globe. The development of forecasts for long periods requires global information, and only meteorological satellites are capable of obtaining operational data on the state of the atmosphere, cloud cover and land and ocean surfaces. Almost 12,000 meteorological stations and posts and 10 weather ships located at various points on the world ocean are engaged in probing the atmosphere on an around the clock basis. The operational information received from satellites helps the large army of meteorologists to determine more accurately the weather forming processes over the oceans and hard to reach land areas, which occupy four-fifths of our planet, and to compile more accurate weather forecasts. Author

N83-28025*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
THE TELECOMMUNICATIONS AND DATA ACQUISITION REPORT Progress Report, Jan. - Mar. 1983
E. C. Posner, ed. 15 May 1983 180 p refs
(NASA-CR-172725; JPL-TDA-PR-42-73; NAS 1.26:172725) Avail: NTIS HC A09/MF A01 CSCL 22A

Archival reports on developments in programs managed by JPL's office of Telecommunications and Data Acquisition (TDA) are presented. In space communications, radio navigation, radio science, and ground-based radio astronomy, it reports on activities of the Deep Space Network (DSN) and its associated Ground Communications Facility (GCF) in planning, in supporting research and technology, in implementation, and in operations. For individual titles, see N83-28026 through N83-28040.

N83-28026*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
THE JPL 1.5-METER CLEAR APERTURE ANTENNA WITH 84.5 PERCENT EFFICIENCY c32
A. G. Cha *In its* The Telecommun. and Data Acquisition Rept. 15 May 1983 p 1-14 refs (For primary document see N83-28025 17-12)
Avail: NTIS HC A09/MF A01 CSCL 20N

The theoretical and experimental study of a 1.5-meter offset dual shaped reflector at 31.4 GHz is detailed. An efficiency of 84.5 percent, a likely new record for reflector antennas, was ascertained through careful measurements. For larger low noise reflector systems, a 2- to 3-dB improvement in G/T performance over the state of the art ultra low noise ground stations and 90 percent or better aperture efficiency now appear feasible.
Author

N83-28027*# Jet Propulsion Lab., California Inst. of Tech., Pasadena. Communication System Research Sect.
SIMPLIFIED SYNDROME DECODING OF (n, 1) CONVOLUTIONAL CODES c61
I. S. Reed (Univ. of Southern California) and T. K. Truong *In its* The Telecommun. and Data Acquisition Rept. 15 May 1983 p 15-21 refs (For primary document see N83-28025 17-12)
Avail: NTIS HC A09/MF A01 CSCL 09B

A new syndrome decoding algorithm for the (n, 1) convolutional codes (CC) that is different and simpler than the previous syndrome decoding algorithm of Schalkwijk and Vinck is presented.

The new algorithm uses the general solution of the polynomial linear Diophantine equation for the error polynomial vector E(D). This set of Diophantine solutions is a coset of the CC space. A recursive or Viterbi-like algorithm is developed to find the minimum weight error vector cirumflex E(D) in this error coset. An example illustrating the new decoding algorithm is given for the binary nonsymmetric (2,1)CC. Author

N83-28028*# Jet Propulsion Lab., California Inst. of Tech., Pasadena. Communications Systems Research Sect.
NODE SYNCHRONIZATION FOR THE VITERBI DECODER c32
G. Lorden, R. McEliece, and L. Swanson *In its* The Telecommun. and Data Acquisition Rept. 15 May 1983 p 22-35 refs (For primary document see N83-28025 17-12)
Avail: NTIS HC A09/MF A01 CSCL 17B

At very low signal to noise ratios such as those that Voyager 2 will encounter at Uranus, the performance of the Reed-Solomon/ Viterbi concatenated coding system could be seriously degraded by loss of node synchronization by the Viterbi decoder. This problem is described and now it can be almost completely avoided with a simple outboard hardware "node synchronizer". This device makes statistical decisions about node sync based on the hard quantized undecoded data stream. In a worst case Voyager-like environment, our method will detect and correct a true loss of node sync (thought to be a very rate event) within several hundred bits; many of these false alarms for our technique is on the order several years. Author

N83-28029*# Jet Propulsion Lab., California Inst. of Tech., Pasadena. Communications Systems Research Sect.
APPROXIMATION TO THE PROBABILITY DENSITY AT THE OUTPUT OF A PHOTOMULTIPLIER TUBE c33
R. J. Stokey and P. J. Lee *In its* The Telecommun. and Data Acquisition Rept. 15 May 1983 p 36-39 refs (For primary document see N83-28025 17-12)
Avail: NTIS HC A09/MF A01 CSCL 09A

The probability density of the integrated output of a photomultiplier tube (PMT) is approximated by the Gaussian, Rayleigh, and Gamma probability densities. The accuracy of the approximations depends on the signal energy alpha: the Gamma distribution is accurate for all alpha, the Raleigh distribution is accurate for small alpha (approximate or less than 1 photon) and the Gaussian distribution is accurate for large alpha (approximate or greater than 10 photons). Author

N83-28030*# Jet Propulsion Lab., California Inst. of Tech., Pasadena. Ground Antennas and Facilities Engineering Sect.
UNIFIED ANALYSIS FOR ANTENNA POINTING AND STRUCTURAL ERRORS. PART 1. REVIEW c37
K. Abichandani *In its* The Telecommun. and Data Acquisition Rept. 15 May 1983 p 40-59 refs (For primary document see N83-28025 17-12)
Avail: NTIS HC A09/MF A01 CSCL 13I

A necessary step in the design of a high accuracy microwave antenna system is to establish the signal error budget due to structural, pointing, and environmental parameters. A unified approach in performing error budget analysis as applicable to ground-based microwave antennas of different size and operating frequency is discussed. Major error sources contributing to the resultant deviation in antenna boresighting in pointing and tracking modes and the derivation of the governing equations are presented. Two computer programs (SAMCON and EBAP) were developed in-house, including the antenna servo-control program, as valuable tools in the error budget determination. A list of possible errors giving their relative contributions and levels is presented. Author

N83-28031*# Jet Propulsion Lab., California Inst. of Tech., Pasadena. Communications Systems Research Sect.
ROOT LOCUS ALGORITHMS FOR PROGRAMMABLE POCKET CALCULATORS c61
E. R. Wechsler *In its* The Telecommun. and Data Acquisition Rept. 15 May 1983 p 60-64 refs (For primary document see N83-28025 17-12)
Avail: NTIS HC A09/MF A01 CSCL 09B

Two algorithms are described which allow the plotting of individual points on a root locus diagram with or without time delay. The development was performed during the design of a continuous phase shifter used in the Baseband Antenna Combiner for the Deep Space Network (DSN). The algorithms, which are expected to be useful in similar DSN efforts, are simple enough to be implemented on a programmable pocket calculator. The coordinates of the open-loop zeros and poles, the gain constant K, and the time delay T are the data inputs. Author

N83-28032*# Jet Propulsion Lab., California Inst. of Tech., Pasadena. Tracking Systems and Applications Sect.
A COVARIANCE ANALYSIS FOR THE DETERMINATION OF BASELINE OBSERVING GPS SATELLITES c17
S. C. Wu *In its* The Telecommun. and Data Acquisition Rept. 15 May 1983 p 65-73 refs (For primary document see N83-28025 17-12)
Avail: NTIS HC A09/MF A01 CSCL 22B

Results of covariance analyses are presented for the determination of baseline vectors of length from 150 m to 4000 km. The data are doubly differenced ranges derived from the signals transmitted by the satellites of the Global Positioning System. The modeling of various error sources is described. The results indicate the low cost baseline determination system is capable of subdecimeter accuracy for baselines up to 1000 km in length. Author

N83-28033*# Jet Propulsion Lab., California Inst. of Tech., Pasadena. Radio Frequency and Microwave Subsystems Sect.
RF DESIGN AND PREDICTED PERFORMANCE FOR A FUTURE 34-METER SHAPED DUAL-REFLECTOR ANTENNA SYSTEM USING THE COMMON APERTURE X-S FEEDHORN c32
W. F. Williams *In its* The Telecommun. and Data Acquisition Rept. 15 May 1983 p 74-84 refs (For primary document see N83-28025 17-12)
Avail: NTIS HC A09/MF A01 CSCL 20N

The Networks Consolidation Program (NCP) will utilize 34-meter shaped dual-reflector Cassegrain antennas. The shaping calculations, the X/S-band feedhorn to be used, and the predicted RF performance of this antenna system are discussed. Author

N83-28034*# Jet Propulsion Lab., California Inst. of Tech., Pasadena. Operations Sustaining Engineering Sect.
THE NETWORK INFORMATION MANAGEMENT SYSTEM (NIMS) IN THE DEEP SPACE NETWORK c82
K. J. Wales *In its* The Telecommun. and Data Acquisition Rept. 15 May 1983 p 85-88 ref (For primary document see N83-28025 17-12)
Avail: NTIS HC A09/MF A01 CSCL 05B

In an effort to better manage enormous amounts of administrative, engineering, and management data that is distributed worldwide, a study was conducted which identified the need for a network support system. The Network Information Management System (NIMS) will provide the Deep Space Network with the tools to provide an easily accessible source of valid information to support management activities and provide a more cost-effective method of acquiring, maintaining, and retrieval data. Author

N83-28035*# Jet Propulsion Lab., California Inst. of Tech., Pasadena. Ground Antennas and Facilities Engineering Sect.
EVALUATION OF ANTENNA FOUNDATION ELASTIC MODULUS c39
H. McGinness and G. Anderson *In its* The Telecommun. and Data Acquisition Rept. 15 May 1983 p 89-91 (For primary document see N83-28025 17-12)
Avail: NTIS HC A09/MF A01 CSCL 20K

An experiment to measure the elastic deflection of the DSS 14 concrete pedestal under the weight of the antenna was conducted in February 1983 and is compared to a similiar experiment made in 1968. Comparison of the results confirms the decrease in elastic modulus measured on core samples recently taken from the pedestal. Author

N83-28036*# Jet Propulsion Lab., California Inst. of Tech., Pasadena. Telecommunications and Data Acquisition Sect.
TECHNIQUES FOR ANALYSIS OF DSN 64-METER ANTENNA AZIMUTH BEARING FILM HEIGHT RECORDS c35
R. Stevens and C. T. Quach *In its* The Telecommun. and Data Acquisition Rept. 15 May 1983 p 92-118 ref (For primary document see N83-28025 17-12)
Avail: NTIS HC A09/MF A01 CSCL 14E

The DSN 64-m antennas use oil pad azimuth thrust bearings. Instrumentation on the bearing pads measures the height of the oil film between the pad and the bearing runner. Techniques to analyze the film height record are developed and discussed. The analysis techniques present the unwieldy data in a compact form for assessment of bearing condition. The techniques are illustrated by analysis of a small sample of film height records from each of the three 64-m antennas. The results show the general condition of the bearings of DSS 43 and DSS 63 as good to excellent, and a DSS 14 as marginal. Author

N83-28037*# Jet Propulsion Lab., California Inst. of Tech., Pasadena. Ground Facilities and Antenna Engineering Sect.
THE APPLICATION OF THE IMPLICIT ALTERNATING-DIRECTION NUMERICAL TECHNIQUE TO THERMAL ANALYSIS INVOLVING CONDUCTION AND CONVECTION c34
R. D. Hughes and T. Charng *In its* The Telecommun. and Data Acquisition Rept. 15 May 1983 p 119-127 refs (For primary document see N83-28025 17-12)
Avail: NTIS HC A09/MF A01 CSCL 20D

A computerized model was developed for analyzing the temperature distribution of a two dimensional body which is located at or near the soil surface and is partially exposed to solar radiation. The body may have one or more interior cavities containing air or another fluid. The methodology which evolved is also applicable to a general class of thermal analyses involving a body surrounded by a semi-infinite medium exposed to surface radiation energy. The theoretical analysis, numerical procedure, and a sample case are discussed. Author

N83-28038*# Jet Propulsion Lab., California Inst. of Tech., Pasadena. Tracking Systems and Applications Sect.
RADIO INTERFEROMETRIC DETERMINATION OF SOURCE POSITIONS, INTERCONTINENTAL BASELINES, AND EARTH ORIENTATION WITH DEEP SPACE NETWORK ANTENNAS: 1971 TO 1980 c32
J. B. Thomas, O. J. Sovers, J. L. Fanselow, E. J. Cohen, G. H. Purcell, Jr., D. H. Rogstad, L. J. Skjerve, and D. J. Spitzmesser *In its* The Telecommun. and Data Acquisition Rept. 15 May 1983 p 128-155 refs (For primary document see N83-28025 17-12)
Avail: NTIS HC A09/MF A01 CSCL 20N

Approximately 2400 observations of extragalactic radio sources were made between August 1971 and February 1980 during 48 separate sessions. These consisted of 259 delay rate observations at 2.3 GHz (S-band), 796 delay and delay rate observations at either S-band of 8.3 GHz (X-band) and 1325 delay and delay rate observations recorded simultaneously at both S- and X-band. A single multiparameter fit has been applied to the observed values of delay and delay rate to extract astrometric and geophysical parameters from this decade-long sequence. The fit produced estimates of 784 parameters, including station locations, radio source positions, polar motion, Universal Time, the precession constant, and solid earth tides. The a priori model included gravitational bending, the 1980 IAU nutation series, the 1976 IAU expressions for Greenwich mean sidereal time and precession, BIH estimates of Universal Time and polar motion, and monthly mean values for zenith troposphere delay. The rms residuals were 0.52 nsec for delay and 0.30 psec/sec for delay rate. Intercontinental baseline lengths were determined with formal uncertainties of 5 to 10 cm. Universal Time and polar motion were measured at 49 epochs, with formal uncertainties (for the more recent data) of 0.5 msec for UT1 and 6 and 2 mas, respectively, for the X and Y components of polar motion. Author

N83-28039*# Jet Propulsion Lab., California Inst. of Tech., Pasadena. TDA Planning Office.
LIMITS TO ARRAYING c32
J. W. Layland *In its* The Telecommun. and Data Acquisition Rept. 15 May 1983 p 156-164 ref (For primary document see N83-28025 17-12)
Avail: NTIS HC A09/MF A01 CSCL 20N

The feasibility limit to various possible array configurations is developed. It is not intended as a last-word analysis, but rather as a guide to which areas would be the most fruitful for future analysis and development. Author

N83-28040*# Jet Propulsion Lab., California Inst. of Tech., Pasadena. TDA Technology Development Office.
DEVELOPMENTS RELATED TO THE FUTURE USE OF THE 32-GHz ALLOCATION FOR DEEP SPACE RESEARCH c32
N. F. deGroot *In its* The Telecommun. and Data Acquisition Rept. 15 May 1983 p 165-175 (For primary document see N83-28025 17-12)
Avail: NTIS HC A09/MF A01 CSCL 20N

The advantage of 32-GHz links, the estimated link performance, and developments in the fields of antennas, low noise preamplifiers, radiometry, and propagation studies are discussed. A description of ways to demonstrate 32-GHz link capability concludes the discussion. Author

N83-28041# Committee on Commerce, Science, and Transportation (U. S. Senate).
SOVIET SPACE PROGRAMS, 1976-80: SUPPORTING VEHICLES AND LAUNCH VEHICLES, POLITICAL GOALS AND PURPOSES, INTERNATIONAL COOPERATION IN SPACE, ADMINISTRATION, RESOURCE BURDEN, FUTURE OUTLOOK
Charles S. Sheldon, II, Christopher Dodge, H., Marcia S. Smith, Geoffrey Perry, Joseph G. Whelan, Francis T. Miko, John P. Hardt, and George D. Holliday Washington GPO Dec. 1982 459 p refs Presented to the Comm. on Com., Sci. and Transportation, 97th Congr., 2d Sess., Dec. 1982 Prepared by the Library of Congr., Congr. Res. Serv.
(GPO-98-515-Pt-1) Avail: Committee on Commerce, Science and Transportation

Supporting facilities and launch vehicles of the Soviet space program, political goals and purposes of the U.S.S.R. in space, Soviet attitudes toward international cooperation in space, Soviet space program administration, and Soviet space program resource burdens are addressed. Author

N83-28042*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
INTERPLANETARY MISSION DESIGN HANDBOOK. VOLUME 1, PART 4: EARTH TO SATURN BALLISTIC MISSION OPPORTUNITIES, 1985-2005
Andrey B. Sergeyevsky and Gerald C. Snyder 1 Mar. 1981 296 p refs
(Contract NAS7-100)
(NASA-CR-172770; JPL-Publ-82-43-Vol-1-Pt-4; NAS 1.26:172770)
Avail: NTIS HC A13/MF A01 CSCL 22A

Graphical data necessary for the preliminary design of ballistic missions to Saturn are provided. Contours of launch energy requirements as well as many other launch and Saturn arrival parameters, are presented in launch date/arrival date space for all launch opportunities from 1985 through 2005. In addition, an extensive text is included which explains mission design methods, from launch window development to Saturn probe and orbiter arrival design, utilizing the graphical data in this volume as well as numerous equations elating various parameters. This is the first of a planned series of mission design documents which will apply to all planets and some other bodies in the solar system. Author

N83-28043# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany).
STUDY ON SPACELAB ASSEMBLY, INTEGRATION VERIFICATION (AIV) PROGRAM GENERALLY APPLICABLE TO OTHER SPACECRAFT PROGRAMS. VOLUME 1: EXECUTIVE SUM-

MARY
J. vanderLippe, L. Kerstein, W. Farr, and W. Kelle Paris ESA Dec. 1982 46 p Sponsored in cooperation with Erno Raumfahrttechnik GmbH 2 Vol.
(Contract ESTEC-4980/82/NL-PP(SC))
(ESA-CR(P)-1722-Vol-1) Avail: NTIS HC A03/MF A01

An aerospace test approach characterized by the inclusion of more modular testing, the performance of environmental (qualification and acceptance) tests on equipment level only, and the performance of acceptance vibration tests using a standard test level (lower than expected in mission phases) is outlined. Spacelab test data were evaluated in relation to ESA space programs. The adequacy of Spacelab test levels were investigated. Potential hardware problems were identified on a statistical basis. The program compares flight test data with original intent. The method is illustrated by the Spacelab avionics equipment ground testing.
Author (ESA)

N83-28044# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany).
STUDY ON SPACELAB ASSEMBLY, INTEGRATION VERIFICATION (AIV) PROGRAM GENERALLY APPLICABLE TO OTHER SPACECRAFT PROGRAMS. VOLUME 2: TECHNICAL REPORT
J. vanderLippe, L. Kerstein, W. Farr, and W. Kelle Paris ESA Dec. 1982 221 p refs Prepared in cooperation with ERNO Raumfahrttechnik GmbH 2 Vol.
(Contract ESTEC-4980/82/NL-PP(SC))
(ESA-CR(P)-1722-Vol-2) Avail: NTIS HC A10/MF A01

An aerospace test approach characterized by the inclusion of more modular testing, the performance of environmental (qualification and acceptance) tests on equipment level only, and the performance of acceptance vibration tests using a standard test level (lower than expected in mission phases) is outlined. Spacelab test data were evaluated in relation to ESA space programs. The adequacy of Spacelab test levels were investigated. Potential hardware problems were identified on a statistical basis. The program compares flight test data with original intent. The method is illustrated by the Spacelab avionics equipment ground testing.
Author (ESA)

13 ASTRODYNAMICS

Inciudes powered and free-flight trajectories; and orbit and launching dynamics.

N83-28045 Bayerische Akademie der Wissenschaften, Munich (West Germany).
REPORT ON THE SPECIAL PROGRAM 78 SATELLITE GEODESY OF THE TECHNICAL UNIVERSITY OF MUNICH Progress Report, 1981 [DIE ARBEITEN DES SONDERFORSCHUNGSBEREICH 78 SATELLITENGEODAESIE DER TECHNISCHE UNIVERSITAET MUNICH]
Manfred Schneider 1982 214 p refs Partly in GERMAN and ENGLISH
(ASTRON-GEODAET-ARB-42; ISBN-3-7696-9785-5; ISSN-0340-7691) Copyright. Avail: Issuing Activity

Laser range finding (characteristics of receivers for stationary Nd:YAG laser range finding systems, Nd:YAG lasers in modular transportable laser-range finders) and radio interferometry (construction of a receiver-system) are discussed. Doppler measurements; the atomic hydrogen maser type Elos 1; technical protection of timing systems against line excess voltage due to lightning; and construction of a seismologic station are considered. Geopotential; the dynamics of the Earth-Moon system; and kinematics of geodetic point fields are treated. Author (ESA)

N83-28046 Royal Aircraft Establishment, Farnborough (England).
TEN ORBIT DETERMINATIONS FOR COSMOS 472 ROCKET
Doreen M. C. Walker 14 Oct. 1982 16 p refs
(RAE-TM-SPACE-314; BR85952) Copyright. Avail: Issuing Activity

The orbit of Cosmos 472 rocket, 1972-04B, was determined from 461 observations at 10 epochs during the last 2 months of its life. The first 8 orbits were satisfactory, with average standard deviations equivalent to 220 m in cross-track distance and 75 m in radial distance. The variation of perigee height was analyzed to obtain four values of density scale height. The first three showed good agreement with CIRA 1972. Unfortunately the geometry of the orbit is such that the decrease in inclination does not yield an exact value of atmospheric rotation. Author (ESA)

N83-28047 Royal Aircraft Establishment, Farnborough (England).
THE LAST 14 DAYS OF SKYLAB 1: ORBIT DETERMINATION AND ANALYSIS
Doreen M. C. Walker 18 Jun. 1982 45 p refs
(RAE-TR-82067; RAE-Space-617; BR85449) Copyright. Avail: Issuing Activity

The orbit of Skylab 1 (1973-27A) was determined using 1400 NORAD observations during the 14 days prior to decay on 1979 July 11. The variations in inclination due to atmospheric rotation and 16th-order resonance with the geopotential are analyzed, to give the first values of 16th-order geopotential coefficients determined from resonance, and a value of 1.10 + or - 0.07 rev/day for the atmospheric rotation rate at a height of 210 to 220 km. The daily changes in semimajor axis are used to determine 13 daily values of air density, at heights from 252 km down to 179 km. All agree well with the CIRA 1972 model, and indicate a smaller semiannual variation than in the early 1970s. The variations of eccentricity and argument of perigee take unusual forms, but detailed analysis shows that the variations are in full accord with the theory for an atmosphere with day-to-night variation in density, with the perigee progressing towards the point of minimum density. Author (ESA)

N83-28048*# PRC Systems Sciences Co., Los Angeles, Calif.
ANALYSIS OF SPACECRAFT ON-ORBIT ANOMALIES AND LIFETIMES
Charles Bloomquist and Winifred Graham 10 Feb. 1983 298 p refs
(Contract NAS5-27279)
(NASA-CR-170565; NAS 1.26:170565; PRC-R-3579) Avail: NTIS HC A13/MF A01 CSCL 22A

Analyses of the on-orbit performance of forty-four unmanned NASA spacecraft are presented. Included are detailed descriptions and classifications of over 600 anomalies; each anomalous incident represents one reported deviation from expected spacecraft performance. Charts depicting satellite lifetimes and the performance of their major subsystems are included. Engineering analyses to further investigate the kinds and frequencies of various classes of anomalies have been conducted. An improved method for charting spacecraft capability as a function of time on orbit is explored. Author

14 GROUND SUPPORT SYSTEMS AND FACILITIES (SPACE)

Includes launch complexes, research and production facilities; ground support equipment, e.g., mobile transporters; and simulators.

For related information see also *09 Research Support Facilities (Air).*

No abstracts in this category.

15 LAUNCH VEHICLES AND SPACE VEHICLES

Includes boosters; manned orbital laboratories; reusable vehicles; and space stations.

N83-28049 Forschungsinstitut fuer Hochfrequenzphysik, Werthoven (West Germany).
ANALYSIS OF INCOHERENT RADAR SIGNATURES OF A TUMBLING ROTATIONALLY SYMMETRIC SATELLITE
H. Gniss and K. Magura May 1982 94 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministeriums der Verteidigung
(Rept-7-82; Lfd-202) Copyright. Avail: Issuing Activity

A method which estimates the intrinsic motion parameters of a satellite from the measured radar signatures is developed. The method is used to determine the long term changes of the angular momentum vector of the Radar Calibration Test Satellite (RADCAT). For the subsequent signature analysis experiments a simple intrinsic motion model is developed. Estimation of shapes and dimensions of simple satellites from the radar signatures by visual inspection; profile reconstruction by geometric optics inverse scattering; and Fourier analysis of the radar signatures are discussed. These analysis methods are applied to the measured radar signatures of the RADCAT and of various laboratory models. The global backscattering behavior of the RADCAT is statistically described by a mixture distribution model. Author (ESA)

N83-28050*# Ecosystems International, Inc., Gambrills, Md.
USER REQUIREMENTS FOR THE COMMERCIALIZATION OF SPACE Final Report
May 1983 138 p refs
(Contract NASw-3674)
(NASA-CR-172762; NAS 1.26:172762) Avail: NTIS HC A07/MF A01 CSCL 22B

The results of investigations of materials processing in space (MPS), space experimentation apparatus, and potential industrial users of MPS commercialization are discussed. Author

N83-28051*# Rockwell International Corp., Downey, Calif. Shuttle Integration and Satellite Systems Div.
SPACE STATION NEEDS, ATTRIBUTES, AND ARCHITECTURAL OPTIONS STUDY Final Executive Summary Report
22 Apr. 1983 102 p 4 Vol.
(NASA-CR-172695; NAS 1.26:172695; SSD-83-0037) Avail: NTIS HC A06/MF A01 CSCL 22B

The top level, time-phased total space program support system architecture is described including progress from the use of ground-based space shuttle, teleoperator system, extended duration orbiter, and multimission spacecraft, to an initial 4-man crew station at 29 deg inclination in 1991, to a growth station with an 8-man crew with capabilities for OTV high energy orbit payload placement and servicing, assembly, and construction of mission payloads in 1994. System Z, proposed for Earth observation missions in high inclination orbit, can be accommodated in 1993 using a space station derivative platform. Mission definition, system architecture, and benefits are discussed. A.R.H.

N83-28052*# Rockwell International Corp., Downey, Calif. Shuttle Integration and Satellite Systems Div.
SPACE STATION NEEDS, ATTRIBUTES, AND ARCHITECTURAL OPTIONS STUDY. VOLUME 1: MISSIONS AND REQUIREMENTS Final Report
22 Apr. 1983 172 p 4 Vol.
(Contract NASw-3683)
(NASA-CR-172696; NAS 1.26:172696; SSD-83-0032-1) Avail: NTIS HC A08/MF A01 CSCL 22B

Science and applications, NOAA environmental observation, commercial resource observations, commercial space processing, commercial communications, national security, technology development, and GEO servicing are addressed. Approach to time phasing of mission requirements, system sizing summary, time-phased user mission payload support, space station facility requirements, and integrated time-phased system requirements are also addressed. Author

N83-28053*# Rockwell International Corp., Downey, Calif. Shuttle Integration and Satellite Systems Div.
SPACE STATION NEEDS, ATTRIBUTES, AND ARCHITECTURAL OPTIONS STUDY. VOLUME 2: PROGRAM OPTIONS, ARCHITECTURE, AND TECHNOLOGY Final Report
22 Apr. 1983 155 p 4 Vol.
(Contract NASw-3683)
(NASA-CR-172697; NAS 1.26:172697; SSD-83-0032-2) Avail: NTIS HC A08/MF A01 CSCL 22B

Mission scenarios and space station architectures are discussed. Electrical power subsystems (EPS), environmental control and life support, subsystems (ECLSS), and reaction control subsystem (RCS) architectures are addressed. Thermal control subsystems, (TCS), guidance/navigation and control (GN and C), information management systems IMS), communications and tracking (C and T), and propellant transfer and storage systems architectures are discussed. Author

N83-28054*# Rockwell International Corp., Downey, Calif. Shuttle Integration and Satellite Systems Div.
SPACE STATION NEEDS, ATTRIBUTES, AND ARCHITECTURAL OPTIONS STUDY. VOLUME 3: COST AND BENEFITS Final Report
22 Apr. 1983 98 p 4 Vol.
(Contract NASw-3683)
(NASA-CR-172698; NAS 1.26:172698; SSD-83-0032-3) Avail: NTIS HC A05/MF A01 CSCL 22B

Cost and schedule, cost/incremental capability, and schedule impact analyses are presented. Quantifiable benefits, space technology, non-quantifiable benefits, and space commercialization are addressed. Author

N83-28055*# Martin Marietta Aerospace, Denver, Colo.
SPACE STATION NEEDS, ATTRIBUTES AND ARCHITECTURAL OPTIONS STUDY. VOLUME 1: EXECUTIVE SUMMARY Final Report
Apr. 1983 43 p 5 Vol.
(Contract NASw-3686)
(NASA-CR-172691; NAS 1.26:172691; SOC-SE-03-01-Vol-1) Avail: NTIS HC A03/MF A01 CSCL 22B

Planetary explorations, Earth observations, space physics, astronomy-astrophysics, solar physics, life/biological/medical sciences, materials processing in space, communications, and technology development are addressed. Mission requirements, integrated user requirements, and space station user accommodation requirements are discussed. Mission implementation concepts and cost, benefits and programmatic analysis are discussed. Author

N83-28056*# Martin Marietta Aerospace, Denver, Colo.
SPACE STATION NEEDS, ATTRIBUTES AND ARCHITECTURAL OPTIONS STUDY. VOLUME 2: MISSION DEFINITION Final Report
Apr. 1983 247 p refs 5 Vol.
(Contract NASw-3686)
(NASA-CR-172692; NAS 1.26:172692; SOC-SE-03-01-Vol-2) Avail: NTIS HC A11/MF A01 CSCL 22B

The space applications and science programs appropriate to the era beyond 1990, those user missions which can utilize the Space Station to an advantage, and user mission concepts so that requirements, which will drive the Space Stations (SS) design are addressed. Author

N83-28057*# Martin Marietta Aerospace, Denver, Colo.
SPACE STATION NEEDS, ATTRIBUTES AND ARCHITECTURAL OPTIONS STUDY. VOLUME 2: APPENDIX C Final Report
Apr. 1983 337 p refs 5 Vol.
(Contract NASw-3686)
(NASA-CR-172693; NAS 1.26:172693;

SOC-SE-03-01-Vol-2-App-C) Avail: NTIS HC A15/MF A01 CSCL 22B

Planetary science, Earth observation, space physics, astronomy, solar astronomy, life/biological sciences, materials processing, commercial materials processing, commercial communications, and technology development are discussed. Author

N83-28058*# Martin Marietta Aerospace, Denver, Colo.
SPACE STATION NEEDS, ATTRIBUTES AND ARCHITECTURAL OPTIONS STUDY. VOLUME 3: MISSION REQUIREMENTS Final Report
Apr. 1983 319 p refs 5 Vol.
(Contract NASw-3686)
(NASA-CR-172700; NAS 1.26:172700; SOC-SE-03-01-Vol-3) Avail: NTIS HC A14/MF A01 CSCL 22B

User missions that are enabled or enhanced by a manned space station are identified. The mission capability requirements imposed on the space station by these users are delineated. The accommodation facilities, equipment, and functional requirements necessary to achieve these capabilities are identified, and the economic, performance, and social benefits which accrue from the space station are defined. Author

N83-28059*# Martin Marietta Aerospace, Denver, Colo.
SPACE STATION NEEDS, ATTRIBUTES AND ARCHITECTURAL OPTIONS STUDY. VOLUME 4: MISSION IMPLEMENTATION CONCEPTS Final Report
Apr. 1983 325 p refs 5 Vol.
(Contract NASw-3686)
(NASA-CR-172701; NAS 1.26:172701; SOC-SE-03-01-Vol-4) Avail: NTIS HC A14/MF A01 CSCL 22B

Architectural options, man/systems integration, subsystem concepts, and space station evolution are discussed. Author

N83-28060*# Martin Marietta Aerospace, Denver, Colo.
SPACE STATION NEEDS, ATTRIBUTES AND ARCHITECTURAL OPTIONS STUDY. VOLUME 5: COST BENEFITS AND PROGRAMMATIC ANALYSES Final Report
Apr. 1983 139 p 5 Vol.
(Contract NASw-3686)
(NASA-CR-170358; NAS 1.26:170358; SOC-SE-03-01-Vol-5) Avail: NTIS HC A07/MF A01 CSCL 22B

The science, applications, commercial, U.S. national security and space operations missions that would require or be materially benefited by the availability of a permanent manned space station in low Earth orbit are considered. Space station attributes and capabilities which will be necessary to satisfy these mission requirements are identified. Emphasis is placed on the identification and validation of potential users, their requirements, and the benefits accruing to them from the existence of a space station, and the programmatic and cost implications of a space station program. Author

N83-28061*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
SPACE AND PLANETARY ENVIRONMENT CRITERIA GUIDELINES FOR USE IN SPACE VEHICLE DEVELOPMENT, 1982 REVISION, VOLUME 2
Robert E. Smith, comp. and George S. West, comp. Jun. 1983 176 p refs
(NASA-TM-82501; ES-83; NAS 1.15:82501) Avail: NTIS HC A09/MF A01 CSCL 22A

Jupiter, satellites of Jupiter, Saturn, Uranus, Neptune, Pluto, asteroids, comets, and interplanetary dust are considered. Author

N83-28062# Naval Postgraduate School, Monterey, Calif.
MISSILE MISDISTANCE REDUCTION: AN INSTRUCTIVE METHODOLOGY FOR DEVELOPING TERMINAL GUIDANCE CONTROL SYSTEMS TO MINIMIZE MISSILE MISDISTANCE M.S. Thesis
Gregory George Voulgarakis Oct. 1982 262 p refs
(AD-A125585) Avail: NTIS HC A12/MF A01 CSCL 17/7

The present thesis is an instructive methodology for developing and improving guidance control systems, in order to minimize the missile misdistance. The complexity of the system which is under development depends heavily upon the defined assumptions, scenarios, specifications, current technology and cost effectiveness. It depends on the designer or the expert, to weight up the advantages and disadvantages of all the above, according to their availability, for obtaining best results. Author (GRA)

N83-28063# European Space Agency, Paris (France).
OPTIMIZATION OF A PASSIVE INFRARED RADIATOR
M. Dinguirard May 1983 59 p Transl. into ENGLISH of "Optimisation d'un Radiateur Infrarouge Passif" rept. CERT-1/6021-DERO ONERA, Toulouse
(ESA-TT-786; CERT-1/6021-DERO) Avail: NTIS HC A04/MF A01

The parameters and the optimum orientation of the Sun shield of an IR radiator mounted on a low orbit satellite were determined using a geometrical method. The radiator is pyramid shaped and should receive no flux from the Earth or the Sun on its base, either directly or by reflection from the walls. A computer program which gives a solution for 1 axis of rotation forming an angle of 62 deg with the yaw axis, and a solution for a radiator axis near the pitch axis, but using an asymmetric radiator geometry (height on Earth side greater than on Sun side) is presented.
Author (ESA)

N83-28024# Joint Publications Research Service, Arlington, Va.
METEOR WEATHER SATELLITES
N. Konkov *In its* USSR Rept.: Space, No. 21 (JPRS-83430) 9 May 1983 p 117-120 Transl. into ENGLISH from Aviats. i Kosmonavtika (Moscow), no. 11, Nov. 1982 p 44-45 (For primary document see N83-28011 17-12)
Avail: NTIS HC A07

16 SPACE TRANSPORTATION

Includes passenger and cargo space transportation, e.g., shuttle operations; and rescue techniques.

For related information see also *03 Air Transportation and Safety* and *85 Urban Technology and Transportation.*

No abstracts in this category.

17 SPACECRAFT COMMUNICATIONS, COMMAND AND TRACKING

Includes telemetry; space communications networks; astronavigation; and radio blackout.

For related information see also *04 Aircraft Communications and Navigation* and *32 Communications.*

N83-28032*# Jet Propulsion Lab., California Inst. of Tech., Pasadena. Tracking Systems and Applications Sect.
A COVARIANCE ANALYSIS FOR THE DETERMINATION OF BASELINE OBSERVING GPS SATELLITES
S. C. Wu *In its* The Telecommun. and Data Acquisition Rept. 15 May 1983 p 65-73 refs (For primary document see N83-28025 17-12)
Avail: NTIS HC A09/MF A01 CSCL 22B

18 SPACECRAFT DESIGN, TESTING AND PERFORMANCE

Includes spacecraft thermal and environmental control; and attitude control.

For life support systems see *54 Man/System Technology and Life Support.* For related information see also *05 Aircraft Design, Testing and Performance* and *39 Structural Mechanics.*

N83-28064* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
METHOD OF DAMPING NUTATION MOTION WITH MINIMUM SPIN AXIS ATTITUDE DISTURBANCE Patent
Henry C. Hoffman, inventor (to NASA) Issued 7 Jun. 1983 10 p Filed 29 Aug 1980 Supersedes N81-12156 (19 - 03, p 0314)
(NASA-Case-GSC-12551-1; US-Patent-4,386,750; US-Patent-Appl-SN-182881; US-Patent-Class-244-169; US-Patent-Class-244-170) Avail: US Patent and Trademark Office CSCL 22B

In a method of and apparatus for damping nutation of a spinning spacecraft, spin axis attitude disturbances are substantially reduced by controlling at least one nutation damping gas thruster to fire with nonuniform gas pulses. During the beginning of a nutation control sequence, the duration of successive gas pulses is gradually increased (up pulsed) from zero to a predetermined maximum duration. The duration of successive pulses is then maintained constant for a time period. Finally, at the end of the nutation control sequence, the duration of successive gas pulses is gradually reduced to zero (down pulsed). Up pulsing of the gas thruster is initiated in response to a predetermined maximum nutation angle measured by an accelerometer. Down pulsing of the thruster is initiated in response to a predetermined minimum nutation angle. Official Gazette of the U.S. Patent and Trademark Office

N83-28065*# Martin Marietta Aerospace, Denver, Colo.
DEVELOPMENT OF AN AUTONOMOUS VIDEO RENDEZVOUS AND DOCKING SYSTEM, PHASE 2 Final Report
John C. Tietz and Thomas E. Richardson Jun. 1983 114 p
(Contract NAS8-34679)
(NASA-CR-170794; NAS 1.26:170794; MCR-83-584) Avail: NTIS HC A06/MF A01 CSCL 22B

The critical elements of an autonomous video rendezvous and docking system were built and used successfully in a physical laboratory simulation. The laboratory system demonstrated that a small, inexpensive electronic package and a flight computer of modest size can analyze television images to derive guidance information for spacecraft. In the ultimate application, the system would use a docking aid consisting of three flashing lights mounted on a passive target spacecraft. Television imagery of the docking aid would be processed aboard an active chase vehicle to derive relative positions and attitudes of the two spacecraft. The demonstration system used scale models of the target spacecraft with working docking aids. A television camera mounted on a 6 degree of freedom (DOF) simulator provided imagery of the target to simulate observations from the chase vehicle. A hardware video processor extracted statistics from the imagery, from which a computer quickly computed position and attitude. Computer software known as a Kalman filter derived velocity information from position measurements. S.L.

N83-28066*# Astro Research Corp., Carpinteria, Calif.
LARGE DIAMETER ASTROMAST DEVELOPMENT, PHASE 1 Final Report
Peter R. Preiswerk, Laurence A. Finley, and Karl Knapp 30 Apr. 1983 67 p ref
(Contract NAS8-34547)
(NASA-CR-170781; NAS 1.26:170781; ARC-TN-11119) Avail: NTIS HC A04/MF A01 CSCL 22B

Coilable-longeron lattice columns called Astromasts (trademark) were manufactured for a variety of spacecraft missions. These flight structures varied in diameter from 0.2 to 0.5 meter (9 to 19 in.), and the longest Astromast of this type deploys to a length of 30 meters (100 feet). A double-laced diagonal Astromast design referred to as the Supermast (trademark) which, because it has shorter baylengths than an Astromast, is approximately four times as strong. The longeron cross section and composite material selection for these structures are limited by the maximum strain associated with stowage and deployment. As a result, future requirements for deployable columns with high stiffness and strength require the development of both structures in larger diameters. The design, development, and manufacture of a 6.1-m-long (20-ft), 0.75-m-diameter (30-in.), double-laced diagonal version of the Astromast is described. Author

N83-28067# Draper (Charles Stark) Lab., Inc., Cambridge, Mass.
ACOSS-11 (ACTIVE CONTROL OF SPACE STRUCTURES, VOLUME 2 Interim Report, Nov. 1981 - Apr. 1982
Robert R. Strunce, Eliezer Fogel, Daniel R. Hegg, Jiquan G. Lin, and James D. Turner Griffiss AFB, N.Y. RADC Nov. 1982 57 p refs 2 Vol.
(Contract F30602-81-C-0180; ARPA Order 3655; AF Proj. C655)
(AD-A124746; RADC-TR-82-295-Vol-2; CSDL-R-1538-Vol-2) Avail: NTIS HC A04/MF A01 CSCL 09/2

Volume 2 of this report describes progress in the application of active controller design methods to the ACOSS Model No. 2 structure. Attention is focused on attenuation of the effects of a broad-band disturbance input upon line-of-sight rotation error, and upon the generation of smooth large-angle slew maneuvers. A ten-mode design model is used. For disturbance attenuation, a new method for sensor/actuator selection based directly on line-of-sight considerations is proposed. Three disturbance-attenuation designs are described. The first assumes a complete knowledge of the disturbance statistics, while the others assume no such explicit knowledge. All three designs indicate convincingly that damping augmentation alone is not sufficient to attenuate effects of the disturbance; augmentation of stiffness is also required. Extensions of large-angle slew control to incorporate feedback are also presented. GRA

N83-28068# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio. High Speed Aero-Performance Branch.
PERFORMANCE METHODS FOR LIFTING ENTRY VEHICLE RANGE ANALYSIS Final Technical Report, Mar. 1979 - Sep. 1981
David T. Johnson, Charles H. Bursey, and Richard C. Nash Nov. 1982 144 p refs
(AF Proj. 2404)
(AD-A125406; AFWAL-TR-82-3036) Avail: NTIS HC A07/MF A01 CSCL 22/3

Parameter optimization methods were applied to maximize lateral range with and without down-range constraints to produce performance footprints. Three lifting entry vehicles with maximum lift-to-drag ratios of 1.89, 2.2, and 2.6, respectively, were used. A simplified bank control procedure was developed which closely appproximated the optimal footprint results in the case where no heating constraints were imposed. GRA

19 SPACECRAFT INSTRUMENTATION

For related information see also *06 Aircraft Instrumentation* and *35 Instrumentation and Photography.*

N83-28069*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
SOME PRACTICAL UNIVERSAL NOISELESS CODING TECHNIQUES, PART 2
Robert F. Rice and Jun-Ji Lee 1 Mar. 1983 64 p refs
(Contract NAS7-100)
(NASA-CR-172769; JPL-Pub-83-17; NAS 1.26:172769) Avail: NTIS HC A04/MF A01 CSCL 22B

This report is an extension of earlier work (Part 1) which provided practical adaptive techniques for the efficient noiseless

coding of a broad class of data sources characterized by only partially known and varying statistics (JPL Publication 79-22). The results here, while still claiming such general applicability, focus primarily on the noiseless coding of image data. A fairly complete and self-contained treatment is provided. Particular emphasis is given to the requirements of the forthcoming Voyager II encounters of Uranus and Neptune. Performance evaluations are supported both graphically and pictorially. Expanded definitions of the algorithms in Part 1 yield a computationally improved set of options for applications requiring efficient performance at entropies above 4 bits/sample. These expanded definitions include as an important subset, a somewhat less efficient but extremely simple 'FAST' compressor which will be used at the Voyager Uranus encounter. Additionally, options are provided which enhance performance when atypical data spikes may be present. Author

20 SPACECRAFT PROPULSION AND POWER

Includes main propulsion systems and components, e.g., rocket engines; and spacecraft auxiliary power sources.

For related information see also *07 Aircraft Propulsion, 28 Propellants and Fuels,* and *44 Energy Production and Conversion.*

N83-28070 Royal Aircraft Establishment, Farnborough (England).
ELECTRIC PROPULSION OF SPACECRAFT
D. G. Fearn 28 Oct. 1981 32 p refs
(RAE-TR-81131; RAE-Space-608; BR83019) Copyright. Avail: Issuing Activity

The merits of electric propulsion technology are discussed explaining that the very high exhaust velocities attainable allow the propellant masses required for most missions to be drastically reduced. The various types of electric thruster are described. The most highly developed and potentially useful thurster, the Kaufman electron bombardment ion thruster, is covered in greater detail, with particular reference to the T5 device. Candidate missions are discussed, ranging from attitude and orbit control functions to the application of ion propulsion to the deployment of solar power satellites. Important terrestrial applications of electric propulsion technology are also mentioned. Author (ESA)

N83-28071*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
A NEW STRATEGY FOR EFFICIENT SOLAR ENERGY CONVERSION: PARALLEL-PROCESSING WITH SURFACE PLASMONS
Lynn Marie Anderson [1982] 16 p refs Presented at the 17th Intersoc. Energy Conversion Eng. Conf., Los Angeles, 8-13 Aug. 1982; sponsored by IEEE
(NASA-TM-82867; NE-1236; NAS 1.15:82867) Avail: NTIS HC A02/MF A01 CSCL 10A

This paper introduces an advanced concept for direct conversion of sunlight to electricity, which aims at high efficiency by tailoring the conversion process to separate energy bands within the broad solar spectrum. The objective is to obtain a high level of spectrum-splitting without sequential losses or unique materials for each frequency band. In this concept, sunlight excites a spectrum of surface plasma waves which are processed in parallel on the same metal film. The surface plasmons transport energy to an array of metal-barrier-semiconductor diodes, where energy is extracted by inelastic tunneling. Diodes are tuned to different frequency bands by selecting the operating voltage and geometry, but all diodes share the same materials. Author

N83-28072*# TRW Defense and Space Systems Group, Redondo Beach, Calif.
HIGH FREQUENCY PLASMA GENERATORS FOR ION THRUSTERS Interim Report, Sep. 1980 - Nov. 1981
William F. DiVergilio, Heinz Goede, and Verryl V. Fosnight Nov. 1981 131 p refs
(Contract NAS3-22473)
(NASA-CR-167957; NAS 1.26:167957) Avail: NTIS HC A07/MF A01 CSCL 21C

The results of a one year program to experimentally adapt two new types of high frequency plasma generators to Argon ion thrusters and to analytically study a third high frequency source concept are presented. Conventional 30 cm two grid ion extraction was utilized or proposed for all three sources. The two plasma generating methods selected for experimental study were a radio frequency induction (RFI) source, operating at about 1 MHz, and an electron cyclotron heated (ECH) plasma source operating at about 5 GHz. Both sources utilize multi-linecusp permanent magnet configurations for plasma confinement. The plasma characteristics, plasma loading of the RF antenna, and the RF frequency dependence of source efficiency and antenna circuit efficiency are described for the RFI Multi-cusp source. In a series of tests of this source at Lewis Research Center, minimum discharge losses of 220+/-10 eV/ion were obtained with propellant utilization of .45 at a beam current of 3 amperes. Possible improvement modifications are discussed. Author

N83-28073# Naval Postgraduate School, Monterey, Calif.
PARTICLE SIZE DETERMINATION IN SMALL SOLID PROPELLANT ROCKET MOTORS USING THE DIFFRACTIVELY SCATTERED LIGHT METHOD M.S. Thesis
Robert Grewelle Cramer, Jr. Oct. 1982 58 p
(Contract F04611-82-X-0008)
(AD-A125735) Avail: NTIS HC A04/MF A01 CSCL 21/8

A dual beam apparatus was developed which simultaneously measured particle size (D32) at the entrance and exit of an exhaust nozzle of a small solid propellant rocket motor. The diameters were determined using measurements of diffractively scattered laser power spectra. The apparatus was calibrated by using spherical glass beads and aluminum oxide powder. Measurements were successfully made at both locations. GRA

N83-28074# Alabama Univ., Huntsville. School of Science and Engineering.
RECENT ADVANCES IN COMBUSTION INSTABILITY ANALYSIS FOR SOLID PROPELLANT ROCKET MOTORS
T. J. Chung May 1982 40 p refs
(Contract DAAH29-81-D-0100)
(AD-A125613; AD-F950346; DRSMI/RK-CR-82-11) Avail: NTIS HC A03/MF A01 CSCL 21/2

Three-dimensional combustion stability integrals are derived with effects of viscosity and vorticity incorporated. For clarity of presentation, the particle distributions in gas dynamics are not considered at this time. It is suggested that the finite element method can be utilized to advantage for complicated geometries and boundary conditions. Some of the initial finite element calculations are demonstrated for an illustrative purpose, pending a full scale numerical applications in the future. Author (GRA)

N83-28075# Oak Ridge National Lab., Tenn.
TECHNOLOGICAL LIMITATIONS ON NUCLEAR-ELECTRIC SPACE-POWER SYSTEMS
A. P. Fraas 1982 11 p refs Presented at the Conf. on Prime Power for High-energy Space Systems. Norfolk, Va., 22-25 Feb. 1982
(Contract W-7405-eng-26)
(DE82-011511; CONF-820228-1) Avail: NTIS HC A02/MF A01

Different types of space power reactors are compared. Information is presented concerning the choice of fluid circuit structural materials; fuel elements, comparison of one loop, two loop, and three loop systems; reliability of mechanical components; reliability of control systems; zero-g problems; and hazards problems. DOE

N83-28021# Joint Publications Research Service, Arlington, Va.
SPACE PROPULSION UNITS OF FUTURE
Aleksandr Sergeyevich Dmitriyev and Vladimir Alekseyevich Koshelev *In its* USSR Rept.: Space, No. 21 (JPRS-83430) 9 May 1983 p 78-100 Transl. into ENGLISH from Kosmich. Dvigateli Budushchego (Novoye v Zhizni, Nauke, Tekhn.: Ser.,

Kosmonavtika, Astronomiya (Moscow), no. 3, Mar. 1982 p 2-31 and 64 (For primary document see N83-28011 17-12)
Avail: NTIS HC A07

23 CHEMISTRY AND MATERIALS (GENERAL)

Includes biochemistry and organic chemistry.

N83-28076*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
THE 1 - (DIALKOXYPHOSPHONYL)METHYL -2,4- AND -2,6-DINITRO- AND DIAMINO BENZENES AND THEIR DERIVATIVES Patent Application
John A. Mikroyannidis (National Research Council, Washington) and Demetrius A. Kourtides, inventors (to NASA) Filed 12 May 1983 11 p
(NASA-Case-ARC-11425-1; US-Patent-Appl-SN-493864) Avail: NTIS HC A02/MF A01 CSCL 07A

The compounds, 1-(Dialkoxyphosphonyl)methyl -1,4- and -1,6-dinitro- and diamino benzenes are prepared by nitrating a (phosphonyl) methyl benzene to produce the dinitro compounds which are then reduced to the diamino compounds. The diamino compounds may be polymerized with dianhydrides or diacyl halides to produce fire resistant polymers. NASA

N83-28077*# Toledo Univ., Ohio. Dept. of Chemistry.
THERMODYNAMICS OF THE POTASSIUM-SULFUR-OXYGEN AND RELATED SYSTEMS Final Report
Jimmie G. Edwards May 1983 56 p refs
(Grant NsG-3250)
(NASA-CR-168155; NAS 1.26:168155) Avail: NTIS HC A04/MF A01 CSCL 20M

The chemical reactions which occur when potassium sulfide, K2S, and potassium sulfite, K2SO3, are heated at temperatures where their vapor pressures are significant, were studied and the vapor pressures and the partial pressures of the chemical products were measured. Mass spectrometry of the vapor of potassium sulfide revealed only K(g). X-ray studies of the solid residues from vaporization experiments revealed K2S2(s) and chemical analyses of the same solid residues showed that the residues approached a composition K2Sx with x in the range 3-4. Vapor pressure of K2S was measured by simultaneous Knudsen-effusion and torsion-effusion (SKETE) in crucibles of aluminum oxide and of graphite. In each such experiment, the vapor pressures agreed initially, but then the apparent pressure by Knudsen-effusion increased suddenly and remained much greater than that by torsion-effusion for the remainder of the experiment. Results of third-law analysis of the torsion pressures imply a delta H (298K) of formation of K2S(s) of -364 + or - 12 kJ/mol. Vapor pressures over K2SO3(s) were measured by simultaneous Knudsen and torsion-effusion and by mass spectrometry. The vapor pressures of both K2S2O5(s) and K2SO3(s) were nonreproducible at a given temperature due to the vaporization reactions of the materials being irreversible under conditions in effusion cells. A.R.H.

N83-28078# Sandia Labs., Albuquerque, N. Mex.
EXPERIMENTAL AND ANALYTICAL STUDIES OF SODIUM INTERACTIONS WITH VARIOUS CONCRETES
A. Suo-Anttila (Science Applications, Inc., Albuquerque, N. Mex.) and J. E. Smaardyk 1982 9 p refs Presented at the Intern. Topical Meeting on LMFBR Safety, Lyon, 18 Jul. 1982
(Contract DE-AC04-76DP-00789)
(DE82-018747; SAND-82-7074C; CONF-820704-14) Avail: NTIS HC A02/MF A01

Mechanistic models of sodium/concrete interactions are described. The SCAM model of interactions with basaltic concrete is being verified by experiments. Modeling of sodium interactions with limestone concrete is still at a preliminary stage but shows promise of being able to predict quantitatively the experimental data. Comparisons with experimental data are presented. DOE

N83-28079# Brown Univ., Providence, R. I. Dept. of Engineering.
ENCYCLOPEDIA OF MATERIALS SCIENCE AND ENGINEERING: IMPROVEMENT OF DUCTILITY
J. Gurland and R. J. Asaro Jun. 1982 19 p refs
(Contract DE-AC02-80ER-10556)
(DE82-018818; DOE/ER-10556/90) Avail: NTIS HC A02/MF A01

Information is presented concerning alloy design for improved ductility; measurements of ductility; effect of second phase particles; effect of strain rate sensitivity; effect of strain state in tension; formability; and dual phase steels. DOE

N83-28080# Yale Univ., New Haven, Conn.
STUDIES OF HYDROGENATION OF SMALL UNSATURATED MOLECULES USING ORGANOMETALLIC CLUSTER COMPOUNDS AS CATALYSTS Progress Report, 1 Jun. 1981 - 31 May 1982
Richard D. Adams Jul. 1982 17 p refs
(Contract DE-AC02-78ER-04900)
(DE82-018796; DOE/ER-04900/2) Avail: NTIS HC A02/MF A01

The addition of arylisothiocyanates to H2Os3(CO)10 was investigated. Forms of coordination of thioformamido ligands at polynuclear metal sites were characterized, these ligands were desulfurized, and the effects of polynuclear coordination of the ligand on the desulfurization was demonstrated. The nature of the thermolytic decarbonylation of one of these products, HOs3(mu3-S)(mu-HC=NR)(CO)9 in the presence and absence of H2 was investigated. In the absence of H2 cluster condensation reactions occur which lead to a series of hexaosmium products. In the presence of H2 the condensation reactions are complicated by the addition of H2 and the formation of polyhydride clusters. Other work discovered an example of the rate sigma + pi coordination form of the isocyanide ligand and its structure and bonding characterized by X-ray crystallographic methods. DOE

N83-28081# Kremen (Seymour S.) and Jhawan (Makhan), Coronado, Calif.
LOWER NET PRESSURE REVERSE OSMOSIS MEMBRANES AND SYSTEMS: COST AND PERFORMANCE ADVANTAGES AND LIMITATIONS Final Report
Seymour S. Kremen, Charles E. Hull, and Mahkan Jhawar Jun. 1982 114 p refs
(Contract DI-14-34-0001-0491)
(PB83-150375; W83-01612; OWRT-C-00180-D(0491)(1)) Avail: NTIS HC A06/MF A01 CSCL 07A

Reverse osmosis systems are generally designed and utilized on the basis of reference water flux and desalting performance at 400 psi net driving pressure (NDP). Membranes now being offered and tested at a preliminary commercial stage are capable of equivalent performance at 200 psi NDP. These membranes offer immediately obvious savings in energy costs for reverse osmosis desalting and water reclamation. In addition, they can make a most important contribution to reduced membrane replacement costs and improved permeate quality when operating on high salinity feeds at higher recovery levels. A number of hypothetical cases were developed and tabulated, assuming a 200 psi NDP sea water membrane was available. GRA

24 COMPOSITE MATERIALS

Includes laminates.

N83-28082 Georgia Inst. of Tech., Atlanta.
ACOUSTIC EMISSION ANALYSIS OF WOVEN GRAPHITE-EPOXY COMPOSITE MATERIALS Ph.D. Thesis
Raymond Garland Clinton, Jr. 1982 482 p
Avail: Univ. Microfilms Order No. DA8229890

The capability of acoustic emission for detecting damaged or substandard composites was evaluated on the basis of analysis of data recorded during tensile tests on various graphite-epoxy

laminates. Specimens with fabrication defects were identified by acoustic emission if such flaws influenced the ultimate strength. A three phased approach was used to determine whether laminates which had been exposed to a hygrothermal environment were qualitatively and quantitatively identifiable using acoustic emission. Results show that the hygrothermal environment exposure degraded the strength of the specimens' strength. The acoustic emission responses of both saturated groups and the 0 deg 90 deg redry group were strongly influenced by hygrothermal conditioning, but the + or - 45 deg redry group was not. Moisture conditioned 0 deg 90 deg specimens were qualitatively and quantitatively identifiable. Only the saturated group of + or - 45 deg laminates was so distinguishable. Dissert. Abstr.

N83-28083 Cornell Univ., New York.
OPTICAL AND STRUCTURAL PROPERTIES OF THIN FILM COMPOSITES Ph.D. Thesis
Ursula Jane Gibson 1982 179 p
Avail: Univ. Microfilms Order No. DA8228377

Metal insulator and bimetallic composite films were made by simultaneous or sequential evaporation of the constituents onto either amorphous or single crystal substrates. Two reflectance and one transmitance measurements were combined and inverted determine the intrinsic optical constants of these materials over the wavelength range 0.2 to 3.0 microns. The optical behavior and transport properties AuAl2O3 and AuMgO were measured, and correlated with their disparate microstructures. The optical behavior was compared to the predictions of three effective medium theories. The differing topological assumptions which form the bases of these theories were correlated with microscopic examination of the morphologies of the films, and it was found that the simple theories adequately predicted the optical response of the composites. The Bruggerman theory was found to adequately predict the behavior of symmetric composites of immiscible metal constituents. Dissert. Abstr.

N83-28084 ERA Ltd., Leatherhead (England). Electromagnetic Interference Dept.
INVESTIGATION OF THE RF PROPERTIES OF CARBON FIBER COMPOSITE MATERIALS Final Report
D. A. Bull, G. A. Jackson, A. McHale, and B. W. Smithers Jul. 1981 278 p refs
(Contract A57B/566; Proj-34-03-3320)
(ERA-81-109) Avail: Issuing Activity

The resistivity of small carbon fiber composite (CFC) samples at frequencies up to 300 MHz was measured using Q-meter techniques. Changes in resistance resulting from prolonged exposure to various liquids were investigated. Electromagnetic shielding (0.15 to 1000 MHz) was measured for panels incorporated as one face of a cubic enclosure or as one surface panel of a helicopter tail cone and for a CFC cylinder. The performances of vhf and uhf aerials when mounted on metallic and CFC ground planes were compared. The implications of the results on the electromagnetic comptability of CFC aircraft are discussed. For individual titles, see N83-28085 through N83-28094.

N83-28085 ERA Ltd., Leatherhead (England).
MEASUREMENTS OF RESISTIVITY OF CARBON FIBER COMPOSITE MATERIALS
B. W. Smithers *In its* Investigation of the RF Properties of Carbon Fiber Composite Mater. Jul. 1982 42 p (For primary document see N83-28084 17-24)
Avail: Issuing Activity

Measurement techniques and results for 10 CFC materials at frequencies up to 300 MHz are presented. Resistivity at dc and frequencies below 1 MHz lies in the range 3 to 15 x 10 to the minus 5th power ohm/m. Above 1 MHz resistivity increases with increasing frequency due to skin effect. The resistivity of unidirectional materials, measured at directions perpendicular to the fiber lay, is two orders of magnitude greater than values measured both parallel to the fiber lay and also for other CFC materials. Author (ESA)

N83-28086 ERA Ltd., Leatherhead (England).
MEASUREMENT OF THE EFFECTS OF LIQUIDS ON THE D.C. RESISTANCE OF CARBON FIBER COMPOSITE MATERIALS
B. W. Smithers *In its* Investigation of the RF Properties of Carbon Fiber Composite Mater. Jul. 1982 16 p (For primary document see N83-28084 17-24)
Avail: Issuing Activity

The effects of fluids on the dc resistance of small samples of CFC were measured by passing a 0.5 A current through the sample using the current terminals, and measuring the voltage drop at the potential terminals with a digital voltmeter. Water absorption to saturation increases the electrical resistance of samples by up to 40% for boiling tap water and 100% for boiling sea water. Protective fluid, hydraulic fluid, paraffin and sea water, all at room temperature, have little effect on the electrical resistance. Woven cloth CFC material is unaffected by all the tests. Author (ESA)

N83-28087 ERA Ltd., Leatherhead (England).
MEASUREMENTS OF THE SCREENING EFFECTIVENESS OF CARBON FIBER COMPOSITE MATERIALS
A. McHale *In its* Investigation of the RF Properties of Carbon Fiber Composite Mater. Jul. 1982 38 p (For primary document see N83-28084 17-24)
Avail: Issuing Activity

Techniques for measuring electromagnetic shielding effectiveness of a number of square CFC panels are described. Panels with various lay-ups and thicknesses were tested and the effects of different methods of jointing and mounting were investigated. Shielding effectiveness in the range 0.15 to 30 MHz and to electric fields in the range 30 to 1000 MHz was measured. Attenuation in the electric mode are close to the upper measurement limit. Attenuation in the magnetic mode falls with decreasing frequency in the range below 30 MHz and may be < 10 to 20 dB below 1 MHz. Author (ESA)

N83-28088 ERA Ltd., Leatherhead (England).
FURTHER MEASUREMENTS OF THE SCREENING EFFECTIVENESS OF CARBON FIBER COMPOSITE MATERIALS
A. McHale *In its* Investigation of the RF Properties of Carbon Fiber Composite Mater. Jul. 1982 20 p (For primary document see N83-28084 17-24)
Avail: Issuing Activity

Shielding effectiveness to magnetic fields in the range 0.15 to 30 MHz and to electric fields in the range 30 to 1000 MHz was measured for 6 square carbon fiber composite panels. Magnetic effectiveness rises linearly with increasing frequency, reaching values of 50 to 60 dB at 30 MHz. Electric shielding effectiveness rises slightly over the frequency range 30 to 1000 MHz; depending on the quality of the electrical contact at the edges of the sheets, values can range from 50 to 90 dB. Results show that shielding integrity, particularly in the high frequency band, is poor unless good electrical contact between panel sections or to the surrounding structure is achieved. The use of insulated bucket fasteners and nonconductive adhesive to attach the panels to metal structures reduces shielding. Author (ESA)

N83-28089 ERA Ltd., Leatherhead (England).
ASSESSMENT OF SCREENING EFFECTIVENESS OF LOW CONDUCTIVITY PANELS
D. A. Bull and G. A. Jackson *In its* Investigation of the RF Properties of Carbon Fiber Composite Mater. Jul. 1982 13 p (For primary document see N83-28084 17-24)
Avail: Issuing Activity

A technique for measuring the electromagnetic shielding properties of carbon fiber composite panels is presented. Attenuation of panels was measured by incorporation into one side of a 1 m cubic enclosure constructed from sheet copper. The measurements were made over the frequency range from 0.15 to 1000 MHz and were separated into attenuation of magnetic fields in the range 0.15 to 30 MHz, and of electric fields in the range 50 to 1000 MHz. Although measurements were performed under near field conditions (aerial separation of 1 m) attenuation was

measured using distant transmitters throughout the range 0.15 to 30 MHz, giving good agreement. Author (ESA)

N83-28090 ERA Ltd., Leatherhead (England).
THE ELECTROMAGNETIC ENVIRONMENT OF AN AIRFRAME PARTLY CONSTRUCTED FROM CARBON FIBER COMPOSITE MATERIAL
A. McHale *In its* Investigation of the RF Properties of Carbon Fiber Composite Mater. Jul. 1982 37 p (For primary document see N83-28084 17-24)
Avail: Issuing Activity

One original panel section of a helicopter tail cone was replaced in turn with demountable carbon fiber composite (CFC) panels. Changes in the electromagnetic environment within the tail cone were investigated. Magnetic shielding effectiveness, field strength and induced current measurements indicate that where electrical contact is maintained, by riveting and bolting, the shielding effectiveness of 4 ply and 16 ply panels is comparable with or greater than the effectiveness of the original metallic structure. Where CFC panels were mounted using adhesive bonding techniques, the shielding is significantly less than for the original structure. Electric field shielding results for CFC and aluminum are comparable above 200 MHz. Between 30 and 200 MHz the adhesively bonded 4 ply CFC panel gives up to 10 dB less shielding than aluminum. Results are limited by the overall shielding integrity of the fuselage. Author (ESA)

N83-28091 ERA Ltd., Leatherhead (England).
THE SCREENING EFFECTIVENESS OF A CARBON FIBER COMPOSITE CYLINDER
A. McHale *In its* Investigation of the RF Properties of carbon Fiber Composite Mater. Jul. 1982 17 p (For primary document see N83-28084 17-24)
Avail: Issuing Activity

The effects of a 0.25 m diameter loop at a distance of 1 m and 2 m (0.15 to 30 MHz), a complex near field source (helicopter hf system at a distance of 5 m, 2 to 24 MHz) and far field (plane wave) sources (0.2 to 12 MHz) on the magnetic shielding effectiveness of a carbon fiber composite (CFC) cylinder was measured. Results for near and distant signal sources agree with each other and are within 12 dB of values obtained by calculation using the dc resistivity value measured for the CFC material. Shielding increases linearly with frequency from 20 dB at 0.175 MHz, a value 35 to 40 dB less than measured for an aluminum cylinder of similar dimensions (up to 70 dB at 30 MHz). Insulated joints introduced into the structure of the CFC cylinder reduce shielding to less than 20 dB over most of the frequency range. Author (ESA)

N83-28092 ERA Ltd., Leatherhead (England).
THE PERFORMANCE OF VHF AND UHF AERIALS MOUNTED ON CARBON FIBER COMPOSITE MATERIALS **c32**
A. McHale *In its* Investigation of the RF Properties of Carbon Fiber Composite Mater. Jul. 1982 19 p (For primary document see N83-28084 17-24)
Avail: Issuing Activity

Antenna isolation, voltage standing wave ratio (VSWR) and radiation pattern measurements were compared for VHF and UHF antennas mounted on carbon fiber composite (CFC) and aluminum cylinders. There is little difference between the CFC and aluminum installations, although within the VHF aircraft communications band the results for the CFC cylinder indicate a greater VSWR and a less uniform azimuthal radiation pattern. One original panel section of a helicopter tail cone was replaced with CFC. Antenna isolation was measured between standard antennas on the helicopter and an antenna first mounted on the original panel and then on the replacement CFC and aluminum panels. No differences are found in the isolation results other than those caused by changes in the tail cone contour. Author (ESA)

N83-28093 ERA Ltd., Leatherhead (England).
EMC IMPLICATIONS OF USING CFC MATERIALS IN AIRCRAFT MANUFACTURE Final Report
A. McHale *In its* Investigation of the RF Properties of Carbon Fiber Composite Mater. Jul. 1982 7 p (For primary document see N83-28084 17-24)
Avail: Issuing Activity

The radio frequency (RF) properties of CFC are summarized and the implications of these properties for the EMC of CFC aircraft are discussed. Problems include the high resistivity of CFC and the difficulty of ensuring sufficient electrical continuity across joints (due to the insulating properties of the resin systems). This results in lower screening, at HF and below, than is expected for metallic aircraft, and greater penetration of RF energy into the aircraft from on board HF transmitters and from external sources such as EMP and lightning. More severe EMC susceptibility requirements for avionic systems for CFC aircraft particularly in the HF band are advocated. Positioning, shielding and bonding of system installations is seen as more important for CFC aircraft EMC design than for metallic aircraft. Author (ESA)

N83-28094 ERA Ltd., Leatherhead (England).
STUDY AND SURVEY OF PUBLISHED WORK ON THE ELECTRICAL AND RF PROPERTIES OF CARBON FIBER COMPOSITE MATERIALS INCLUDING WORK ON ELECTROMAGNETIC SCREENING
B. W. Smithers *In its* Investigation of the RF Properties of Carbon Fiber Composite Mater. Jul. 1982 56 p (For primary document see N83-28084 17-24)
Avail: Issuing Activity

An annotated bibliography containing 140 references concerning the electrical and RF properties of carbon fiber composite for aircraft construction is presented. Author (ESA)

N83-28095*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
DIAMONDLIKE FLAKE COMPOSITES Patent Application
Bruce A. Banks, inventor (to NASA) Filed 17 May 1983 10 p (NASA-Case-LEW-13837-1; US-Patent-Appl-SN-495381) Avail: NTIS HC A02/MF A01 CSCL 11D

A carbon coating is vacuum arc deposited on a smooth surface of a target which is simultaneously ion beam sputtered. The bombarding ions have sufficient energy to create diamond bombs. Spalling occurs as the carbon deposit thickens. The resulting diamond like carbon flakes are mixed with a binder or matrix material to form a composite material having improved thermal, electrical, mechanical, and tribological properties when used in aerospace structures and components. NASA

N83-28096# Royal Aircraft Establishment, Farnborough (England).
CHARACTERISTICS OF FATIGUE FAILURES IN FIBRE-REINFORCED PLASTICS
H. E. Franz Feb. 1982 36 p refs Transl. into ENGLISH from Z. Wekstofftech (West Germany), no. 11, 1980 p 343-360 (RAE-Trans-2081; BR84016) Avail: NTIS HC A03/MF A01

Macro- and micro-fractography studies were made of static and fatigue failures in unfilled epoxy resins and glass and carbon fiber reinforced epoxy resin composites. Fatigue striations were observed in the resins, similar to those in metals and in the static specimens, parabolic cusps, Wallner lines and other features were observed. Delaminated surfaces of the glass reinforced plastics showed fatigue striations of a different morphology to that in the unfilled resin. This is believed to be the first time such striations were observed in fiber composites with a fiber content of 70% by volume. The directions of the striations are closely analysed and from them conclusions are drawn about local stress distributions and local crack propagation in fiber composites. S.L.

N83-28097*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
CHARACTERIZATION OF DELAMINATION AND TRANSVERSE CRACKING IN GRAPHITE/EPOXY LAMINATES BY ACOUSTIC EMISSION
Amar Garg and Ori Ishaei May 1983 15 p refs Prepared for Presentation at the 1st Intern. Symp. on Acoustic Emission from Reinforced Plastics, San Francisco, 18-21 Jul. 1983

(NASA-TM-84370; A-9353; NAS 1.15:84370) Avail: NTIS HC A02/MF A01 CSCL 11D

Efforts to characterize and differentiate between two major failure processes in graphite/epoxy composites - transverse cracking and Mode I delamination are described. Representative laminates were tested in uniaxial tension and flexure. The failure processes were monitored and identified by acoustic emission (AE). The effect of moisture on AE was also investigated. Each damage process was found to have a distinctive AE output that is significantly affected by moisture conditions. It is concluded that AE can serve as a useful tool for detecting and identifying failure modes in composite structures in laboratory and in service environments. Author

N83-28098*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

FABRICATION AND EVALUATION OF BRAZED TITANIUM-CLAD BORSIC/ALUMINUM SKIN-STRINGER PANELS

Thomas T. Bales, Dick M. Royster, and Robert R. McWithey Jul. 1980 41 p refs

(NASA-TP-1674; L-13413; NAS 1.60:1674) Avail: NTIS HC A03/MF A01 CSCL 11D

A successful brazing process was developed and evaluated for fabricating full-scale titanium-clad Borsic/aluminum skin-stringer panels. A panel design was developed consisting of a hybrid composite skin reinforced with capped honeycomb-core stringers. Six panels were fabricated for inclusion in the program which included laboratory testing of panels at ambient temperatures and 533 K (500 F) and flight service evaluation on the NASA Mach 3 YF-12 airplane. All panels tested met or exceeded stringent design requirements and no deleterious effects on panel properties were detected followng flight service evaluation on the YF-12 airplane. Author

N83-28099*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

COMPRESSION PANEL STUDIES FOR SUPERSONIC CRUISE VEHICLES Final Report

Robert R. McWithey, Dick M. Royster, and William L. Ko Mar. 1980 24 p refs

(NASA-TP-1617; L-13525; NAS 1.60:1617) Avail: NTIS HC A02/MF A01 CSCL 11D

Results of analytical and experimental studies are summarized for titanium, boron fiber reinforced aluminum matrix composite, Borsic fiber reinforced aluminum matrix composite, and titanium sheathed Borsic fiber reinforced aluminum matrix composite stiffened panels. The results indicate that stiffened panels with continuous joints (i.e., brazed, diffusion bonded or adhesive bonded joints) are more structurally efficient than geometrically similar panels with discrete joints (i.e., spotwelded or bolted joints). In addition, results for various types of fiber reinforced aluminum matrix stiffened panels indicate that titanium sheathed Borsic fiber reinforced aluminum matrix composite panels are the most structurally efficient. Analytical results are also presented for graphite fiber reinforced polyimide matrix composite stiffened panels and superplastically formed and diffusion bonded titanium sandwich panels. Author

N83-28100*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

FABRICATION AND EVALUATION OF BRAZED TITANIUM-CLAD BORSIC/ALUMINUM COMPRESSION PANELS Final Report

Dick M. Royster, Robert R. McWithey, and Thomas T. Bales Mar. 1980 43 p refs

(NASA-TP-1573; L-13112; NAS 1.60:1573) Avail: NTIS HC A03/MF A01 CSCL 11D

Processes for brazing Borsic/aluminum composite materials that eliminate diffusion of braze alloy constituents into the aluminum matrix developed. One brazing study led to the development of a hybrid composite which combines high strength Borsic/aluminum and ductile titanium to form a material identified as titanium clad Borsic/aluminum. The titanium foil provides the Borsic/aluminum with a durable outer surface and serves as a diffusion barrier which alleviates fiber and matrix degradation during brazing. Titanium clad Borsic/aluminum skin panels were joined to titanium clad Borsic/aluminum stringers by brazing and were tested in end compression at room and elevated temperatures. The data include failure strength, buckling strength, and the effects of brazing on the material properties. Predicted buckling loads are compared with experimental data. R.E.S.

N83-28101*# Societe Nationale des Poudres et Explosifs, Vert-Le-Petit (France). Centre de Recherches du Bouchet.

GRAPHITE POLYSTYRYL PYRIDINE (PSP) STRUCTURAL COMPOSITES Final Report

B. Malassine 18 Feb. 1981 57 p refs

(Contract NASw-3251)

(NASA-CR-166283; NAS 1.26:166283) Avail: NTIS HC A04/MF A01 CSCL 11D

PSP6022 M resin, PSP 6024 M resin and W 133 Thormel T 300 graphite fabric reinforced panels were fabricated and provided to NASA Ames Research Center. PSP6022 and PSP6024 characteristics, process specifications for the fabriation of prepregs and of laminates are detailed. Mechanical properties, thermomechanical properties and moisture resistance were evaluated. PSP6022 and PSP6024 appear as high performance thermostable systems, very easy to process, being soluble in MEK for prepregging and being cured at no more than 250C, and even 200C. Author

N83-28102# European Space Agency, Paris (France).

DAMAGE MECHANICS OF FIBER-REINFORCED COMPOSITE MATERIALS

Mar. 1983 242 p refs Transl. into ENGLISH of "Schadensmech. von faserverstaerkten Verbundstrukt." DFVLR, Brunswick Report DFVLR-Mitt-81-25, Jun. 1981 Presented at Colloq. on Struct. Mech., Brunswick, 25 Jun. 1981 Original report in GERMAN previously announced as ESA-98313

(ESA-TT-758; DFVLR-Mitt-81-25) Avail: NTIS HC A11/MF A01; original German version available from DFVLR, Cologne DM 71,10

The development of principles of damage mechanics for composite materials analogous to fracture mechanics for metals is surveyed. Because of the large number of possible kinds of damage and the heterogeneity of the materials the scope and the degree of difficulty exceed those of fracture mechanics by far. The main tasks are the detection and identification of defects by suitable nondestructive test methods as well as the prediction of their significance under realistic service conditions. For individual titles, see N83-28103 through N83-28108.

N83-28103# European Space Agency, Paris (France).

NONDESTRUCTIVE TESTING OF CFRP LAMINATES

R. Schuetze *In its* Damage Mech. of Fiber-Reinforced Composite Mater. (ESA-TT-758) Mar. 1983 p 5-46 refs Transl. into ENGLISH from "Schadensmech. von faserverstaerkten Verbundstrukt.", Rept. DFVLR-Mitt-81-25, DFVLR, Brunswick, Jun. 1981 (For primary document see N83-28102 17-24)

Avail: NTIS HC A11/MF A01; DFVLR, Cologne DM 71,10

Ultrasonic and X-ray, nondestructive test methods were developed. The use of ultrasonic fault detection on laminated CFRP sheets was emphasized. Ultrasonic precision test equipment was assembled and a transducer was adapted for the detection of delaminations. Ultrasonic test results obtained with 1.5 to 3.2 mm thick CFRP laminates with different internal defects demonstrate a high level of resolution. The measurements are validated by X-ray imagery and by destructive tests. Two series of scans show the progression of delaminations during repeated loading. The results of improved X-ray analysis, using a contrast agent (tetrabromethane), are also included. Author (ESA)

N83-28104# European Space Agency, Paris (France).

MONITORING DAMAGE PROGRESSION IN CFRP BY ACOUSTIC EMISSION

Jonathan Awerbuch *In its* Damage Mech. of Fiber-Reinforced Composite Mater. (ESA-TT-758) Mar. 1983 p 47-88 Transl.

into ENGLISH from "Schadensmech. von faserverstaerkten Verbundstruckt.", Rept. DFVLR-Mitt-81-25, DFVLR, Brunswick, Jun. 1981 (For primary document see N83-28102 17-24)
Avail: NTIS HC A11/MF A01; DFVLR, Cologne DM 71,10

Damage initiation and progression were monitored through acoustic emission in a variety of graphite/epoxy T300/914C laminates. The monitoring of acoustic emission as a nondestructive test technique was evaluated. Data recorded include: accumulative events and counts; count rate and number of counts per event as a function of load; line location and amplitude distribution histograms of events; and the cumulative events amplitude distributions at different load levels, all for emissions occurring within a preset area of interest along the specimen. The results demonstrate the potential for using acoustic emission to locate existing damage, detect and track damage initiation and progression, identify potential fracture sites, and possibly distinguish between the major failure mechanisms of different laminates, all of which ultimately aid in forecasting the strength and life of individual specimens during proof testing. Proper test methodology is emphasized, identifying pitfalls. Author (ESA)

N83-28105# European Space Agency, Paris (France).
EFFECT OF ENVIRONMENTAL INFLUENCES ON THE MECHANICAL PROPERTIES OF CFRP
M. Gaedke *In its* Damage Mech. of Fiber-Reinforced Composite Mater. (ESA-TT-758) Mar. 1983 p 89-127 refs Transl. into ENGLISH from "Schadensmech. von faserverstaerkten Verbundstruckt.", Rept. DFVLR-Mitt-81-25, DFVLR, Brunswick, Jun. 1981 (For primary document see N83-28102 17-24)
Avail: NTIS HC A11/MF A01; DFVLR, Cologne DM 71,10

Hygrothermal, thermal and radiation degradation of carbon fiber reinforced plastics were studied. Specific aerospace environmental conditions affect mechanical properties, such as strength and moduli. Variations in these properties, either decreasing or increasing, were determined. The test program and procedures are described. Test results demonstrate that environmental moisture and temperature parameters cause a decrease in mechanical strength and elasticity. Thermal cycling (+95 to -155 C) is particularly detrimental, while outgassing is also related to temperature. Results of electron irradiation show degradation similar to thermal damage. Author (ESA)

N83-28106# European Space Agency, Paris (France).
DAMAGE PROPAGATION IN CFRP UNDER CYCLIC LOADING
R. Prinz *In its* Damage Mech. of Fiber-Reinforced Composite Mater. (ESA-TT-758) Mar. 1983 p 128-173 refs Transl. into ENGLISH from "Schadensmech. von faserverstaerkten Verbundstruckt.", Rept. DFVLR-Mitt-81-25, DFVLR, Brunswick, Jun. 1981 (For primary document see N83-28102 17-24)
Avail: NTIS HC A11/MF A01; DFVLR, Cologne DM 71,10

A damage model based on delamination propagation between the plies of a multidirectional laminate due to tension-compression fatigue was developed. The results of finite element calculations of load transfer on the edges of the specimens were compared with observations of delamination initiation during tests. These defects propagate due to interlaminar stresses up to an area which is critical for buckling of parts of the deliminated test specimens. Good correlation between experimentaly observed residual strength after cyclic loading and analytical predictions, given the statistical scatter of test results, is shown. Author (ESA)

N83-28107# European Space Agency, Paris (France).
LAYER MODEL FOR THE CALCULATION OF STRESSES IN DEFECT ZONES
H. Eggers *In its* Damage Mech. of Fiber-Reinforced Composite Mater. (ESA-TT-758) Mar. 1983 p 174-209 refs Transl. into ENGLISH from "Schadensmech. von faserverstaerkten Verbundstruckt.", Rept. DFVLR-Mitt-81-25, DFVLR, Brunswick, Jun. 1981 (For primary document see N83-28102 17-24)
Avail: NTIS HC A11/MF A01; DFVLR, Cologne DM 71,10

An extended layer model is presented with which stress and crack propagation in a debonded zone can be calculated with sufficient accuracy while preserving computational economy. Every fiber structure contains small flaws where the fibers are partially debonded. The kind and size of flaws that can be tolerated without damaging the whole structure intrinsically are discussed. The propagation of an initial crack within the flaw is described. The three-dimensional stress state around a flaw which is imbedded in a larger structure is calculated. Results, using specialized finite elements in order to determine the stress state in flat-fiber reinforced shells with layer cracks and delaminations, are shown. Author (ESA)

N83-28108# European Space Agency, Paris (France).
MECHANISMS AND CHARACTERISTICS OF THE INFLUENCE OF ENVIRONMENTAL CONDITIONS ON THE BEHAVIOR OF CFRP
P. Nitsch *In its* Damage Mech. of Fiber-Reinforced Composite Mater. (ESA-TT-758) Mar. 1983 p 210-240 refs Transl. into ENGLISH from "Schadensmech. von faserverstaerkten Verbundstruckt.", Rept. DFVLR-Mitt-81-25, DFVLR, Brunswick, Jun. 1981 (For primary document see N83-28102 17-24)
Avail: NTIS HC A11/MF A01; DFVLR, Cologne DM 71,10

Degradation mechanisms and characteristic values for environmental effects on graphite-epoxy composite materials are discussed with reference to aeronautics. The generally attractive strength properties of CFRP tend to diminish under the influence of irradiation, thermal cycling, and moisture. Quantitative results are shown for UV radiation damage, temperature dependence (including outgassing), and for effects of moisture content. Author (ESA)

N83-28109# Technische Hogeschool, Delft (Netherlands). Dept. of Aerospace Engineering.
ARAMID AS A STRUCTURAL MATERIAL
W. H. M. vanDreumel Jun. 1982 17 p refs
(VTH-LR-356) Avail: NTIS HC A02/MF A01

The structural possibilities of aramid were compared with those of carbon fibers. The use of aramid fibers in deformation as well as buckling controled designs was analyzed. A compression test was performed on a full aramid stiffened panel in order to test feasibility as a part of the primary aircraft structure. The test indicates that a moderate weight increase, compared to graphite, is compensated by cost performance, insensitivity to impact loading and safer metal-like failure behavior. Author (ESA)

N83-28619# California Univ., Livermore. Lawrence Livermore Lab.
FIBER COMPOSITE MATERIALS TECHNOLOGY FOR FLYWHEEL ENERGY STORAGE
T. T. Chiao and R. L. Moore *In* Courtesy Assoc., Inc. Proc. of the DOE Phys. and Chem. Storage Ann. Contractors' Rev. Meeting Dec. 1982 p 250-254 (For primary document see N83-28586 17-44)
Avail: NTIS HC A25/MF A01

N83-28620# General Electric Co., Philadelphia, Pa. Space Systems Div.
COMPOSITE HYBRID FLYWHEEL ROTOR DESIGN OPTIMIZATION AND FABRICATION
Anthony P. Coppa *In* Courtesy Assoc., Inc. Proc. of the DOE Phys. and Chem. Storage Ann. Contractors' Rev. Meeting Dec. 1982 p 255-262 refs (For primary document see N83-28586 17-44)
Avail: NTIS HC A25/MF A01

25 INORGANIC AND PHYSICAL CHEMISTRY

Includes chemical analysis, e.g., chromatography; combustion theory; electrochemistry; and photochemistry.

For related information see also *77 Thermodynamics and Statistical Physics.*

N83-28110 Illinois Univ., Chicago.
THE GROUP COMBUSTION OF LIQUID FUEL IN LAMINAR

SPRAY JET Ph.D. Thesis
Ho Young Kim 1982 251 p
Avail: Univ. Microfilms Order No. DA8225151

The present study examines the global configuration, detailed structure, and combustion characteristics of sprays under various firing conditions represented by various principal parameters including group combustion number, fuel-air mass ratio, Reynolds number, and spray angle. A system of conservation equations of spray flames in an axisymmetric configuraton is solved by a finite difference method for n-Butylbenzen (C10H14). An extensive spray sensitivity study reveals remarkable insight into the group flame structure which can be adopted as a basic engineering criteria for spray flame classification. It can be used to develop practical guides for the design of atomizers and burners. Highlights of the study are described in the following. There are three principal spray group combustion modes that may occur independently in a spray burner. These combustion modes are external, internal and critical group combustion modes, according to the relative magnitude of the length of the flame and the spray jet.
Dissert. Abstr.

N83-28111 Rockefeller Univ., New York.
BIZARRE BEHAVIOR IN GASES AND MAGNETS Ph.D. Thesis
Talbot Michael Katz 1982 115 p
Avail: Univ. Microfilms Order No. DA8225131

In the van der Waals theory of phase transitions, gases are hard spheres with weak long range attractive pair interactions. Certain gases with long range interactions which vary smoothly with distance are not described by the familiar van der Waals equation with Maxwell's Rule. Using Kac's integral equation technique to study a class of such models, standard simplifying techniques were not made rigorous. The theory of phase transitions in magnetic systems is equivalent to that of the classical gas liquid transitions. The free energy of a large class of interactions in the spherical magnetic model was solved. In the usual case of positive (ferromagnetic) interactions, the Fourier transform of the interaction has its maximum at zero; the magnetization isotherms (magnetization plotted as a function of external field strength) are smooth above a certain critical temperature and have a jump discontinuity at zero field strength below the critical temperature, which corresponds to a non-zero residual magnetization even in zero field.
Dissert. Abstr.

N83-28112# British Library Lending Div., Boston Spa (England).
EXPERIMENT DESIGN IN STUDY OF PHYSICAL AND CHEMICAL PROPERTIES OF COMPONENTS OF METAL-CARBON SYSTEM
Yu. V. Pozhidaev and B. P. Burylev 1982 5 p refs Transl. into ENGLISH from Izv. Vyssh. Uched. Zaved., Chernaya Met. (USSR), v. 4, 1982 p 6-8
(BLL-M-20966-(5828.4)) Avail: British Library Lending Div., Boston Spa, Engl.

An experimental study of the pressure of saturated vapor of cobalt and nickel over melts with carbon, using the steep ascent method, was based on full two factor experiment design. The carbon concentration in the melt and the melt temperature were taken as the factors. Methods for correcting the output parameter (the pressure of the saturated metal vapor) in the experiment design were examined.
Author

N83-28113 Denver Univ., Colo.
A NEW EXPERIMENTAL METHOD FOR THE DETERMINATION OF THE RATIO OF MASS AND THERMAL DIFFUSIVITIES FOR BINARY GAS MIXTURES Ph.D. Thesis
Daniel Lawrence Birkenheuer 1982 140 p
Avail: Univ. Microfilms Order No. DA8229110

An experimental method is developed for determination of D/alpha, the ratio of mass to thermal diffusivities, in binary gas mixtures containing a condensable vapor. The value of D/alpha for the air water vapor and argon water vapor systems is determined. For these gas mixtures, with D/alpha >, the experiment entails flowing a saturated gas stream through a tube whose temperature decreases with distance. A theoretical model shows that above a critical gas flow velocity, which is a sensitive function of D/alpha the gas becomes supersaturated and a droplet cloud of the condensable component is formed. The onset of cloud formation is sharply defined, enabling accurate determination of the critical flow velocity. A detailed numerical model is used to determine the rate D/alpha from the experimental data. The precision in the ratio D/alpha obtained using this method is shown to be smaller than the precision in experimental methods for independent measurements of D or alpha.
Dissert. Abstr.

N83-28114 Defence Research Information Centre, Orpington (England).
ELECTROCHEMICAL DETECTORS FOR MICRO HIGH-PERFORMANCE LIQUID CHROMATOGRAPHY
M. Goto Jan. 1983 11 p refs Transl. into ENGLISH from Bundeski (Japan), no. 9, 1981 p 648-650
(DRIC-T-6672; BR84673) Copyright. Avail: Issuing Activity

The general features of electrochemical detectors are described, since these provide a better sensitivity than optical detectors when applied to the analysis of various urinary metabolites and when the cell volumes are reduced to 1 cu mm. An amperometric detector employing a thin layer electrolysis cell and a thin layer cell containing two glassy carbon electrodes specially developed for catecholamines analysis are described. These detectors present greater detection sensitivity and several substances can be detected simultaneously by using three or more working electrodes at selected potentials.
Author (ESA)

N83-28115 Defence Research Information Centre, Orpington (England).
EXTRACTION OF THALLIUM AND SIMULTANEOUS EXTRACTION OF LEAD, CADMIUM AND THALLIUM FOR QUANTITATIVE ANALYSIS BY FLAME ATOMIC ABSORPTION SPECTROSCOPY
C. Wachter and W. Weisweiler Jan. 1983 11 p refs Transl. into ENGLISH of Microchem. Acta (West Germany), v. 1, 1982 p 307-315
(DRIC-T-6821; BR86794) Copyright. Avail: Issuing Activity

Flame atomic absorption spectroscopy was used for the quantitative determination of thallium. For this, thallium is to be separated from the organic source material if source has complex matrix structure. Since thallium is present in the micro g to g region an extraction procedure is adapted. This procedure consists of complex formation of thallium with APDC and DDDC and the extraction of the complexes into liquid phase using MIBK as solvent. For the extraction an optimal pH is found to be about 6 while for the simultaneous extraction of the three elements lead, cadmium and thallium a pH-value of about 5 is preferred. For quantitative analysis by flame atomic absorption spectroscopy the detection limit for thallium in the organic extract is found to be .07 micro g/ml.
Author (ESA)

N83-28116# British Library Lending Div., Boston Spa (England).
THE GIBBS ENERGY OF THE WUSTITE FORMATION REACTION
A. A. Lykasov, G. G. Mikhailov, and V. I. Shiskov 1982 7 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Chernaya Met. (USSR), v. 3, 1982 p 6-9
(BLL-M-26922-(5828.4)) Avail: British Library Lending Div., Boston Spa, Engl.

The theory of ionic regular solutions is utilized for describing the thermodynamic properties of wustite. A formula is derived for obtaining the dependence of the equilibrium oxygen pressure on wustite composition; calculations from this formula show excellent agreement with literature data and with experimental results.
Author

N83-28117# Defence Research Information Centre, Orpington (England).
ELECTROCHEMICAL DETECTORS FOR MICRO HIGH-

PERFORMANCE LIQUID CHROMATOGRAPHY
M. Goto Jan. 1983 10 p refs Transl. into ENGLISH from Bunseki (Japan), no. 9, 1981 p 648-650
(BLL-DRIC-Trans-6672-(3623.66); BR84673) Avail: NTIS HC A02/MF A01

Although optical detectors of the ultraviolet, refractive index and fluorescence type used to be the principal form of detector employed for high performance liquid chromatography (HPLC), electrochemical detectors have gained some popularity as a means of complementing optical detector function. Detectors with a single working electrode and with two working electrodes are separately considered. They are shown to have a much greater detection sensitivity than ultraviolet and fluorescence detectors of the same cell volume. Other advantages are also described. S.L.

N83-28118# Royal Aircraft Establishment, Farnborough (England).
THE TOXIC NATURE OF GASES FROM THE THERMAL DECOMPOSITION OF COMBUSTIBLE MATERIALS
P. E. Picart, J. P. Delcroix, and M. Guerbet Feb. 1982 21 p refs Transl. into ENGLISH from the proceedings of the AGARD Conf. No. 309(B8) Toxic Hazards in Aviation (Canada), 1980 p 1-10 Conf. held in Toronto, 1980
(RAE-Trans-2082; BR84017) Avail: NTIS HC A02/MF A01

When fire breaks out in the passenger cabin of an aircraft, escape is not immediately possible and it is necessary, first, to return to land. In this case toxic gases cause the major problem. For this reason it is necessary to select materials which will cause minimal toxicity in case of fire on board. A test chamber giving sufficient control over the thermal decompositions of materials to reproduce real life atmospheres as accurately as possible was designed. This prototype must have the following specific characteristics: a relatively small enclosed volume, rapid renewal of the air (a total change in three minutes) and the possibility of almost a total stoppage of ventilation, in order that it should be capable of simulating those situations encountered in flight. The prototype test chamber is described and the first results obtained with it are given. The aim is to be able, ultimately, and depending upon the danger criteria chosen, to supply bases against which selection of materials for the furnishing of aircraft cabins can be made. S.L.

N83-28119# Electrotechnical Lab., Ibaraki (Japan).
COLORIMETRY FOR FLUORESCENT MATERIALS
Hideyuki Minato Oct. 1982 99 p refs
(Rept-829; ISSN-0366-9106) Avail: NTIS HC A05/MF A01

A practical measuring method used for accurate prediction of colors of fluorescent materials under arbitrary illuminants was examined. Different from ordinary reflective materials, colors of fluorescent materials vary according to the irradiation light source since they not only reflect the radiation of the same wavelength as the incident one, but also emit the fluorescent radiation in the region of their specific wavelengths. Therefore it is required to overcome such problems as are not encountered in the colorimetery of ordinary object color. The work is composed of two steps. The first step is investigation of the two monochromator method, which is considered to be the most accurate method in principle. The second step is investigation of the one monochromator method, a practical and reliable measuring method based on the evaluation made by the two monochromator method. Author

N83-28120# Brookhaven National Lab., Upton, N. Y.
STOCHACTIC MODELING OF PHYSIOLOGIC PROCESSES WITH RADIOTRACERS AND POSITRON EMISSION TOMOGRAPHY
A. Rescigno, R. M. Lambrecht, and C. C. Duncan 1982 16 p refs Presented at Conf. on Appl. of Phys. to Med. and Biol., Trieste, Italy, 30 Mar. 1982
(Contract DE-AC02-76CH-00016)
(DE82-012468; BNL-31102) Avail: NTIS HC A02/MF A01

The compartment model, so often used in nuclear medicine and in pharmacokinetics, is formed by a set of linear differential equations of order one with constant coefficients; its validity depends upon the hypothesis that the system described contains a finite number of components, and that each component is homogeneous. These hypotheses exclude the presence of diffusion and of age dependent processes, or in general of transport of a non Markovian nature. The fact that frequently the experimental data agree with this model does not necessarily prove the model is appropriate, but only that it is flexible. In addition to the consistency with the experimental data, an obvious conceptual requirement of the model is that its parameters could be interpreted in terms of perceivable physical properties. All this considered, it will be demonstrated that the experimental data can be examined in terms of a model making minimum number of assumptions and giving the best physical interpretations to the parameters involved. DOE

N83-28121# Oak Ridge National Lab., Tenn.
EVALUATION OF FORMALDEHYDE EMISSION FROM TEST PANELS OF UREA-FORMALDEHYDE FOAM INSULATION
A. R. Hawthorne and R. B. Gammage 1982 20 p refs Presented at 75th Ann. Meeting on the Air Pollution Control Assoc., New Orleans, 20 Jun. 1982
(Contract W-7405-eng-26)
(DE82-017440; CONF-820627-7) Avail: NTIS HC A02/MF A01

One important potential source of formaldehyde in the home is urea-formaldehyde foam insulation (UFFI). Measurements of the formaldehyde emission from test panels simulating a section of a house wall were made approximately 16 months after initial foaming. The test panels are approximately 16 inches wide and 8 feet tall with a latex painted gypsum board interior wall and an exterior wall consisting of cellulose sheathing with aluminum or cedar siding. Nine different commercially available foams were tested. Three types of measurements were conducted. The first type was designed to simulate the conditions in a corner room of a house with an air exchange rate of approximately 0.7 1/h. Clean air was flowed over the face of the interior wall and the emitted concentration of formaldehyde measured. Based on these measurements, projected room concentrations for the nine UFFI panels ranged from 0.03 to 0.4 ppM with an average of 0.13 +-0.11 ppM. DOE

N83-28122# KVB, Inc., Irvine, Calif.
COMBUSTION EVALUATION OF RESIDUAL FUEL OIL FROM TWO-STAGE LIQUEFACTION Final Report
J. K. Arand, L. J. P. Chrisman, M. N. Mansour, and L. J. Muzio Feb. 1983 74 p refs
(EPRI Proj. 1412-5)
(DE83-901448; EPRI-AP-2845) Avail: NTIS HC A04/MF A01

A two stage coal liquefaction (TSL) residual fuel oil was tested to evaluate the combustion and emission characteristics of the fuel. Testing was performed with a blend of TSL solids and a coal derived distillate designed to simulate the TSL residual fuel oil. Further tests were conducted with the actual TSL residual fuel oil prepared entirely from products of two stage liquefaction processing. Combustion variables included furnace excess O2, fuel atomization, burner stoichiometry, combustion air swirl and boiler load. In general, the tests showed that TSL residual fuel oil burns well with flame characteristics similar to those of No. 6 fuel oil. Due to the high nitrogen content of the fuel (approximately 0.9 percent by weight), NO emissions from TSL residual fuel oil under normal combustion (unstaged) were 400 to 500 pp greater than the emission level produced by a conventional No. 6 fuel oil. Staged combustion was effective in reducing NO emissions by up to 60%; however, the reduction in NO emissions was obtained at the expense of doubling the particulate emissions. Modification of atomizer design variables provided a reduction in both particulate and NO emissions. It is suggested that further refinement of the combustion variables may allow the use of this fuel as a replacement for petroleum derived residual fuel oil in utility type applications. DOE

N83-28123# California Univ., Livermore. Lawrence Livermore Lab.
A PORTABLE, REMOTELY OPERATED, COMPUTER-CONTROLLED, QUADRUPOLE MASS SPECTROMETER FOR FIELD USE

R. D. Friesen, J. C. Newton, and C. F. Smith Apr. 1982 3 p refs Presented at the ASMS 30th Ann. Conf. on Mass Spectrometry and Allied Topics, Honolulu, Hawaii, 6-11 Jun. 1982
(Contract W-7405-eng-48)
(DE82-013938; UCRL-87566; CONF-820630-2) Avail: NTIS HC A02/MF A01

A portable, remote controlled mass spectrometer was required to analyze prompt post event gas from the nuclear cavity in support of the underground testing program. A Balzers QMG-511 quadrupole was chosen for its ability to be interfaced to a DEC LSI-11 computer and to withstand the ground movement caused by this field environment. The inlet system valves, the pumps, the pressure and temperature transducers, and the quadrupole mass spectrometer are controlled by a read only memory based DEC LSI-11/2 with a high-speed microwave link to the control point which is typically 30 miles away. The computer at the control point is a DEC LSI-11/23 running the RSX-11 operating system. The instrument was automated as much as possible. DOE

N83-28124# California Univ., Livermore. Lawrence Livermore Lab.
ADDITIVE THERMOCHEMICAL EFFECTS IN TURBULENT EROSIVE BOUNDARY LAYERS
Alfred C. Buckingham and JoAnne L. Levatin 18 Jan. 1983 8 p refs Presented at the 1983 JANNAF Propulsion Meeting, Monterey, Calif., 14-18 Feb. 1983 Submitted for publication
(Contract W-7405-eng-48)
(DE83-006278; UCRL-87251; CONF-830206-1) Avail: NTIS HC A02/MF A01

Previously obtained interior ballistics and wall boundary layer modeling results indicate that significant reduction in erosive heating is expected when finely divided particles are dispersed through the propellant combustion flow field. Attention was first placed on the particle size influences, together with particle dispersal dynamics in both turbulent combustion core flow and the erosive wall boundary layer region. Submicron thermochemically inert particles were predicted to disperse readily to the near wall region where they were then entrained in the boundary layer. This was estimated to substantially reduce the predicted erosive heat and mass transfer and experimentally confirmed. Examination of the time averaged turbulent boundary layer macrostructure changes indicated that inertial influences were primarily responsible for this reduction in erosive heating to gun barrel walls. The boundary layers were thickened by the additives and erosive diffusion gradients were corresponding reduced. DOE

N83-28125# Arrowhead Plastic Engineering, Inc., Muncie, Ind.
SEPARATION OF ALCOHOL-WATER MIXTURES BY SELECTIVE ADSORPTION Final Technical Report
Robert J. Dearborn 24 Dec. 1982 28 p refs
(Contract DE-FG02-81R-510297)
(DE83-005040; DOE/R5/10297/T2) Avail: NTIS HC A03/MF A01

The plastic waste that is generated during the manufacture of electric storage batteries was utilized in the preparation of new and different resins. This waste is pure polyvinyl chloride and in storage batteries sintered sheets of the polymer are used as cell separators. The scrap, in the form of thin flakes, can be ground to any particle size range including powder. If the particles are about 30 to 60 mesh they are granular and physically resemble the resins used in adsorption and ion exchange processes. A procedure was developed for the replacement of a portion of the chlorine atoms in the granular polyvinyl chloride with amine nitrogen-containing groups. Reaction conditions were investigated and it was established that low temperatures (80 to 950 C) and rather long reaction times (24 to 72 hours) resulted in minimal degradation of the polyvinyl chloride and replacement of up to one-third of the chlorine atoms with amine groups. In most instances the modified PVC resins contained four to six percent nitrogen. DOE

N83-28126# California Univ., Berkeley. Lawrence Berkeley Lab. Dept. of Chemical Engineering.
HOMOGENEOUS HYDROGENATION OF MODEL-COAL COMPOUNDS Ph.D. Thesis
Gregg A. Cremer, Theodore Vermeulen, and Richard H. Fish May 1982 114 p refs
(Contract DE-AC03-76SF-00098)
(DE82-017146; LBL-14216) Avail: NTIS HC A06/MF A01

The objectives of this study were twofold to assess the effectiveness of metal carbonyls and (related complexes) as homogeneous hydrogenation catalysts for model coal compounds and to gain fundamental information about low temperature, low pressure coal liquefaction. Since a catalytically active transition metal hydride may form in a number of ways, reaction conditions included various combinations of hydrogen, carbon monoxide, and water (or aqueous base). The effect of the different conditions on catalyst activity and relative reaction rates was investigated and mechanistic interpretations were formulated. DOE

N83-28127# Los Alamos Scientific Lab., N. Mex.
MEASUREMENT OF REVERSIBLE AND IRREVERSIBLE ENERGY REQUIREMENTS FOR HYDROGEN PRODUCTION IN HYBRID CYCLES
E. I. Onstott 1982 8 p refs Presented at the World Hydrogen Energy Conf. 4 Cal. Tech., Pasadena, Calif., 12-17 Jun. 1982
(Contract W-7405-eng-36)
(DE82-008111; LA-UR-82-173; CONF-820605-7) Avail: NTIS HC A02/MF A01

The rate penalties for steady state electrical energy consumption in the sulfuric acid hybrid cycle were assessed in terms of the anode mechanisms, the electrolysis cell losses; the anodic overpotential losses and the cathodic overpotential losses, all at 295 K. A cyclic, quarter wave energy input was used. The reversible mechanistic penalty vs reversible H2SO4 is 0.26 V, and is a Gibbs energy barrier at 0.01 1/sq am. At 1540 1/sq am the irreversible cell loss was 0.12 V and the anodic concentration overpotential loss was 0.21 V. At the same rate the cathodic overpotential loss was 0.17 V. DOE

N83-28128# Los Alamos Scientific Lab., N. Mex.
USE OF OXIDES IN THERMOCHEMICAL WATER-SPLITTING CYCLES FOR SOLAR HEAT SOURCES. COBALT OXIDES
W. M. Jones and M. G. Bowman 1982 7 p refs Presented at World Hydrol. Energy Conf., Pasadena, Calif., 13 Jun. 1982
(Contract W-7405-eng-36)
(DE82-011977; LA-UR-82-584; CONF-820605-15) Avail: NTIS HC A02/MF A01

The concept of utilizing oxide decompositions in advanced thermochemical hydrogen cycles for solar heat sources is introduced. It has particular interest in allowing direct transimission of energy to the process through an air window. A cycle for the Co3O4-CoO pair would, schematically: (1) Co3O4 = 3CoO + 1/2 O2; (2) I2(s,1) + Mg(OH)2 + 3CoO = MgI2(aq) + Co3O4 + H2O (1); (3) H2O + MgI2(aq) =MgO + 2HI; (4) 2 HI = H2 + I2; and (5) MgO + H2O = Mg(OH)2. Reaction (2) should give a high concentration of MgI2 that would be favorable for (3). The solutions would also contain iodine dissolved as polyiodide, partly offsetting this advantage. Preliminary results indicate that reaction (2) is slow at 150 deg O2 (4); and Mg. It is surmised that the mechanism of (2) consists of the iodine disproportional reaction (6), followed by reaction (7); (6) I2(s,1) + Mg(OH)2 = 5/6 MgI2(aq) + 1/6 Mg(IO3)2(aq) + H2O(1); and (7) 1/6 Mg(IO3)O2(aq) + 3 CoO = 1/6 MgI2(aq) + Co3O4. DOE

N83-28129# California Univ., Berkeley. Lawrence Berkeley Lab. Energy and Environment Div.
SOLVOLYTIC LIQUEFACTION OF WOOD UNDER MILD CONDITIONS Ph.D. Thesis
Suen-Man Yu Apr. 1982 179 p refs
(Contracts W-7405-eng-48; DE-AC03-76SF-00098)
(DE82-017946; LBL-14096) Avail: NTIS HC A09/MF A01

Conversion of wood to liquid products requires cleavage of bonds which crosslink the wood structure. A low severity wood solubilization process utilizing a solvent medium consisting of a small amount of sulfuric acid and a potentially wood derivable

alcohol was examined. In one half hour of reaction time at 250 C under 15 psia starting nitrogen pressure, over 95% of the wood (maf) was rendered acetone soluble. The product is a soft, black, bitumen like solid at room temperature but readily softens at 140 C. Between 25 and 50% of the original wood oxygen, depending on alcohol used, was removed as water. Approximately 2 to 17% of the alcohols were retained in the product. Gel permeation chromatography showed that the product's media molecular weight is around 300. Based on experimental and literature results, a mechanism for wood solubilization is proposed. DOE

N83-28130# Case Western Reserve Univ., Cleveland, Ohio. Dept. of Chemical Engineering.
ZINC ELECTRODEPOSITION AND DENDRITIC GROWTH FROM ZINC-HALIDE ELECTROLYTES Final Report
U. Landau, B. D. Cahan, J. R. Selman (Illinois Inst. of Technology), and P. C. Symons, ed. May 1982 357 p refs
(EPRI Proj. 1198-3)
(DE82-905357; EPRI-EM-2393) Avail: NTIS HC A16/MF A01

Roughness evolution and dendritic growth restrict the thickness of electroplated zinc during the charge of zinc/halogen batteries and thereby impose operating and economic limitations on their application. Although technologically important, there has so far been little fundamental understanding of dendritic growth and, in the absence of an adequate theory, the phenomenon has been treated mostly empirically. A systematic theoretical and experimental study quantitatively characterizing roughness and dendrite evolution on zinc electrodes is reported here. Comprehensive models were theoretically derived accounting for the initiation and for the propagation rates of dendrites in terms of system parameters including the current, applied potential, reaction kinetics, surface energy, macroscopic and microscopic geometry and convective flow. Morphological stability criteria were applied to define conditions under which electrodes are expected to remain smooth. DOE

N83-28131# NWT Corp., San Jose, Calif.
HITCH COMPUTER CODE: CHEMISTRY AND pH ESTIMATES OF CONCENTRATING AQUEOUS SOLUTIONS
J. Leibovitz, C. E. Shoemaker, and G. R. Snyder May 1982 83 p refs Sponsored by EPRI
(EPRI Proj. 404-1)
(DE82-904373; EPRI-NP-2388) Avail: NTIS HC A05/MF A01

A computer code HITCH has been developed to calculate the solution composition and the high-temperature pH of faulted aqueous environments during concentration by boiling at high temperature. The code includes hydrogen, hydroxyl, ammonium, sulfate, bisulfate, bicarbonate, chloride, sodium, magnesium and calcium ions, ammonia and carbon dioxide. The code written in BASIC language is formulated in two versions primarily for application to steam generator waters. The BULK model applies to bulk water that is converted to steam as it rises in the steam generator. Linear concentration factors are used over a range up to about 100 fold. The ISOLATED CAVITY model applies to solutions in heated crevices. Here, logarithmic concentration factors extend to higher ranges. Calculations in both models are stopped above 5 molal due to the limits of the present data base. The manual describes inputs, outputs, test cases and code options in detail for the user. DOE

N83-28132# Idaho State Univ., Pocatello. Dept. of Geology.
SOLUBILITY OF METHANE IN WATER UNDER NATURAL CONDITIONS: A LABORATORY STUDY Final Report, 1 Apr. 1978 - 30 Jun. 1982
Charles W. Blount and Leigh C. Price Jun. 1982 159 p refs
(Contract DE-AS08-78ET-12145)
(DE82-017680; DOE/ET-12145/1) Avail: NTIS HC A08/MF A01

The solubility of methane in aqueous solutions was determined over a broad range of temperature, pressure and salinities. The effect of dissolved carbon dioxide and ethane on methane solubility was determined at 302 F. Also the solubility of crude oil and water in methane was determined over a broad range of temperatures and pressures. The solubility of methane is raised by increasing pressure and temperature (above about 170 F). There is a solubility minimum near 170 F at constant pressure and salinity. Ionic salts effectively salt methane out of solution at all concentrations investigated. The effect of the addition of small amounts of carbon dioxde or ethane to the gas dissolved in aqueous solutions is to enhanced methane solubility compared to solutions without other gases. Higher concentrations of dissolved gases, depending upon the salinity and the gas involved, decrease aqueous methane solubility. DOE

N83-28133# Tennessee Valley Authority, Muscle Shoals, Ala. Office of Natural Resources.
CHEMICAL INTERACTIONS IN ISOLATED COAL-FIRED POWER PLANT PLUMES: CONVERSION OF SULFUR DIOXIDE TO SULFATE AEROSOLS. VOLUME 1: PLUME CHEMISTRY STUDIES
James F. Meagher, Elizabeth M. Bailey, and Leonard Stockburger, III Mar. 1982 152 p refs
(DE82-903161; TVA/ONR/ARP-82/11-Vol-1) Avail: NTIS HC A08/MF A01

Instrumented aircraft were used to determine the rate of oxidation of sulfur dioxide to sulfate aerosols within the dispersing plumes of three coal fired power plants. Rate measurements were made during each season under a wide variety of meteorological conditions. Experiments were conducted during daylight and nighttime hours. The effect of particulate loading was examined in studies conducted under reduced electrostatic precipitator performance. Measurements of primary sulfate and sulfur dioxide were also made. The average oxidation rate during fall and winter was found to be .0003 per hour. During the summer an average rate of 0.012 h-1 was found. A rapid conversion of 0.5 to 1.0% of the emitted sulfur dioxide occurs in the immediate vicinity of the power plant during all seasons. The reduction in electrostatic precipitator performance resulted in a decrease in the average conversion rate from .0013 h to .0008 h. Author

N83-28134# Colorado School of Mines, Golden. Dept. of Chemical and Petroleum Refining Engineering.
PHASE-EQUILIBRIUM PROPERTIES OF COAL-DERIVED LIQUIDS Technical Progress Report, Jan. - Jun. 1982
V. F. Yesavage and A. J. Kidnay 1 Jul. 1982 15 p refs
(Grant DE-FG22-80PC-30230)
(DE82-017775; DOE/PC-30230/T3) Avail: NTIS HC A02/MF A01

On July 1, 1980, work was initiated on a program for experimental vapor liquid equilibrium measurements on coal-derived liquids. During the last six months, data for the binary system water ethanol were obtained at 150 C, 200 C, and 250 C. At 150 C and 200 C or low ethanol concentrations, there was substantial agreement between our data and data in the literature. At 250 C or ethanol concentrations greater than 0.4 mole fraction, there is disagreement, which is probably due to uncertainties in the literature data. Work was begun on the m-cresol-quinoline binary system, which is a system that should be of significance in coal-derived liquid studies. Work is continuing on characterizing coal-derived liquid boiling point fractions. DOE

N83-28135# American Cyanamid Co., Stamford, Conn. Chemical Research Div.
DEVELOPMENT OF SIGNIFICANTLY IMPROVED CATALYSTS FOR COAL LIQUEFACTION AND UPGRADING OF COAL EXTRACTS Quarterly Progress Report, 1 Oct. - 31 Dec. 1981
V. T. Sinha, M. Butensky, and D. Hyman 1982 42 p refs
(Contract DE-AC22-81PC-40091)
(DE82-014540; DOE/PC-40091/T1; QPR-1) Avail: NTIS HC A03/MF A01

During 1979-1980, a new generation of very active, long lived catalysts for hydrotreating was discovered in the Chemical Research Division of the American Cyanamid Company at Stamford. The catalysts were based on a unique substrate prepared in bead form from a rehydratable alumina. Their spherical shape, crush strength, and abrasion resistance seem ideally suited for use in fluidized bed reactors such as the three (or four) phase

fluidized bed reactors used in the H-Oil and the H-Coal processes developed by Hydrocarbon Research, Incorporated. Further, their internal pore structure is almost infinitely controllable, and pore size distributions which would be active for the hydroliquefaction and demetallation reactions but resistant to poisoning and deactivation reactions can be produced if identified. DOE

N83-28136# State Univ. of New York at Buffalo, Amherst.
CATALYTIC COAL LIQUEFACTION Quarterly Report, Apr. - Jun. 1982
Sol W. Weller 1982 19 p refs
(Grant DE-FG22-81PC-40781)
(DE82-019047; DOE/PC-40781/T3; FE-2013-20) Avail: NTIS HC A02/MF A01

Coal liquefaction experiments were carried out in a stirred autoclave under nitrogen. Tetralin was employed as solvent, and the catalyst, when used, was ammonium paramolybdate (impregnated) or stannous chloride (powdered). Production of pentane soluble oil was higher in the runs with catalysts, but the net hydrogen transfer from tetralin to coal was less when catalyst was used. Coal and powdered stannous chloride exhibited a marked synergistic effect on the dehydrogenation of tetralin. A free radical mechanism was suggested to explain this effect, and model experiments with bibenzyl (but no coal) gave results that were consistent with this mechanism. An apparent synergistic effect of coal and impregnated ammonium paramolybdate was shown to be attributable simply to improved distribution (higher surface area) of the impregnated catalyst. DOE

N83-28137# Pittsburgh Univ., Pa. Dept. of Chemical and Petroleum Engineering.
THE SUPERCRITICAL FLUIDS FOR REACTION AND EXTRACTION OF COAL AND HEAVY OILS Quarterly Progress Report, 1 Mar. - 31 May 1982
J. S. Gopal, G. D. Holder, and G. V. Deshpande Jun. 1982 12 p refs
(Contract DE-FG22-81PC-40800)
(DE82-016710; DOE/PC-40800/3; QPR-3) Avail: NTIS HC A02/MF A01

The experimental unit for the coal-water experiments has been erected. Some modifications in the inlet and outlet ports of the autoclave have been made. The transfer lines have been kept to a minimum to avoid any temperature gradients and refluxing of water in the lines. The system has been leak tested and is found to be in proper operating condition. Samples of brown coal have been received and the coal has been crushed and ground under adequate precautionary measures to a desirable particle size. It has been planned to initially carry out the experiments with a coal sample in the -100 mesh range. Major changes in the experimental set-up to study the solubility of solids in supercritical fluids have been made. Two equilibrium cells will be used instead of an autoclave. A metered supply of the supercritical fluid phase will be provided to the two cells and the extracted sample will be collected in a suitable solvent for chromatographic analysis.
Author

N83-28138# Brigham Young Univ., Provo, Utah. Lab. for Combustion Research.
BASIC COMBUSTION AND POLLUTANT-FORMATION PROCESSES FOR PULVERIZED FUELS Quarterly Technical Progress Report, 1 Apr. - 30 Jun. 1982
Geoffrey J. Germane and L. Douglas Smoot Jul. 1982 42 p refs
(Grant DE-FG22-80PC-30306)
(DE82-019054; DOE/PC-30306/T7; QTPR-7) Avail: NTIS HC A03/MF A01

This contract study of basic combustion and pollutant formation processes for pulverized solid fossil fuels includes coal-water mixtures (CWM) and coal chars derived from pyrolysis, liquefaction or gasification processes. Contract work also includes adaptation of computer code techniques to the combustion of these fossil fuels. Highlights for this quarter are: the CWM reactor facility neared completion for initial tests with a methane flame; physical characterization analyses of chars are largely complete; a modified ASTM method for the proximate analysis of coals was used on the Tosco, FMC and Occidental chars with results that correlate well with other chars; adequate quantities of five chars have been obtained in anticipation of combustor testing; a review was made to identify char oxidation and gasification models for potential implementation into the overall PCGC-2 model; several candidate models were identified from which one or two approaches will be considered. DOE

N83-28139# Physical Sciences, Inc., Woburn, Mass.
EFFECTS OF PREIGNITION ON PULVERIZED COAL COMBUSTION Quarterly Report, 1 Jan. - 31 Mar. 1982
Girard A. Simons, G. Kothandaraman, Steven P. Schertzer, and Mary Jane Palm 1982 37 p refs
(Contract DE-AC22-80PC-30293)
(DE82-013956; DOE/PC-30293/6; PSI-TR-322; QR-6) Avail: NTIS HC A03/MF A01

Pore structure optimization is complete as reported predicting that high reactivity chars require high porosities and a higher concentration of large pores. The dependence of these quantities on heating rate and final temperature is illustrated. The data obtained for Texas Lignite suggest that porosity (hence reactivity) is strongly dependent on the final pyrolysis temperature with the maximum porosity occurring at 1300 K. The data also indicate that to a lesser extent, the heating rate affects pore structure. Higher heating rates increase the relative number of large pores and thus enhance reactivity by a factor of two. Hence, the optimum pore structure for char reactivity is obtained by preparing char at 1300 K and high heating rates (> 1000 K/s). Such chars are four times as reactive as chars prepared at 2000 K and 1 to 10 K/s. The theory of pore evolution was completed last quarter. Potential mechanisms of pore evolution were identified and described. DOE

N83-28140# University of Western Michigan, Kalamazoo. Dept. of Chemistry.
FUNDAMENTAL OF NITRIC OXIDE FORMATION IN FOSSIL FUEL COMBUSTION Quarterly Progress Report, 20 Dec. 1981 - 28 Mar. 1982
Thomas Houser and Michael E. McCarville Jun. 1982 14 p refs
(Grant DE-FG22-81PC-40805)
(DE82-019044; DOE/PC-40805/2; QPR-2) Avail: NTIS HC A02/MF A01

Experiments to examine the oxidation of HCN in the presence of several fuel additives, using an atmospheric pressure flow system were continued in order to determine the mechanism of NO formation from fuel nitrogen oxidation. Modifications of the flow system were made so that direct sampling of the reactor effluent for gas chromatographic analysis is possible. A series bypass arrangement of the two columns, molecular sieve 5A and porous polymer C 101, was fabricated for more accurate analysis of the light gases, N2, O2, CO, CO2 and N2O. In addition, several experiments were made with a plug flow, U tube reactor as well as the stirred flow reactor. At fuel rich conditions significant NO yields were obtained when CO was the fuel additive, even at equivalence ratios of 2 and above. However, higher temperatures were necessary for these yields at the higher ratios. DOE

N83-28141# Sangamon State Univ., Springfield, Ill.
RENEWABLE REPLACEMENTS FOR PETROCHEMICALS Final Report, Jan. 1981 - Feb. 1982
1982 61 p refs
(Contract DE-FG02-80R5-10214)
(DE82-018893; DOE/R5-10214/2) Avail: NTIS HC A04/MF A01

The purpose of this project was to investigate the components in extracts of members of the plant genus Solidago, the goldenrods. Special attention is given to the hydrocarbon fraction extracted, as its components (volatile low molecular weight compounds and cis-polyisoprene, or natural rubber) or substitutes for them are currently derived in large part from petroleum. Another extract fraction is a mixture of oils, polyphenols, and some other relatively polar low molecular weight compounds. Attempts were made to

separate the components in the two extract fractions for structure studies. Separatory techniques used were thin-layer chromatography, gel permeation chromatography, low pressure fractional distillation, and other chromatographic and partitioning methods. DOE

N83-28142# Iowa State Univ. of Science and Technology, Ames. Dept. of Physics.
ON-LINE LASER SPECTROSCOPY WITH A COOLED He-JET TRANSPORT SYSTEM
David Lewis, Rollin Evans, Cary Davids, Miles Finn, George Greenlees, and Stanley Kaufman 1982 8 p refs Presented at the Conf. on Lasers in Nucl. Phys., Oak Ridge, Tenn., 21 Apr. 1982 Prepared in cooperation with Argonne National Lab., Argonne, Ill., and Minnesota Univ., Minneapolis
(Contracts W-31-109-eng-38; DE-AC02-79ER-10496; Grant NSF PHY-79-21336)
(DE83-008529; CONF-820428-11) Avail: NTIS HC A02/MF A01

A transport system with pure, cooled helium to carry radioactive atoms produced by heavy ion reactions from the target chamber into a laser spectroscopy chamber was used to make nuclear size and shape determinations for short lived nuclei. The device is attached to a beam line of the Argonne superconducting heavy ion Linac. Upon leaving the transport system, the atoms form a cooled atomic beam suitable for several high sensitivity, high precision spectroscopic techniques. The use of the photon-burst method which permits high resolution hyperfine structure measurements with only a few atoms per second is planned. The efficiency of the helium jet system, the extension of the photon burst method to slow and optically pumped transitions, and the present status of the project are discussed. DOE

N83-28143# California Univ., Livermore. Lawrence Livermore Lab.
HYDRIDES OF CeNi5, MmNi5, CaO 2(CeO 65MmO 35)O 8Ni5, CaO 2CeO 8Ni5, CaO 2MmO 8Ni5, AND MIXED CeNi5/MmNi5
J. F. Lakner and T. S. Chow Sep. 1982 51 p refs
(Contract W-7405-eng-48)
(DE83-006305, UCRL-53354) Avail: NTIS HC A04/MF A01

Six intermetallic alloys [CeNi5, MmNi5, CaO2(CeO65MmO35) O8Ni5, CaO2CeO8Ni5, CaO2MmO8Ni5, and a mixed alloy, CeNi5/MmNi5] were investigated for their suitability to provide high hydrogen capacity and their potential for use in providing substantial hydrogen pressure at both low and high temperatures. A second phase of our investigation dealt with ball milling and hydriding and dehydriding cycles to produce fine particles for use in hydride powder transfer studies. A summary of several Van't Hoff plots is also included for hydride forming alloys. DOE

N83-28144# Mound Lab., Miamisburg, Ohio.
ELECTROLYSIS OF TRITIATED WATER IN SOLID POLYMER ELECTROLYTE CELLS
R. E. Ellis 9 Apr. 1982 28 p refs
(Contract DE-AC04-76DP-01289)
(DE82-012189; MLM-2902) Avail: NTIS HC A03/MF A01

An investigation of the electrolysis of tritiated water using General Electric Company solid-polymer-electrolyte (SPE) cells was carried out a MRC-Mound. Several operating systems were built and tests done on three types of G.E. cell designs. Tritium concentrations of 1 to 300 Ci/ml in a single addition of tritiated water were used in the first four tests. Total cell operating time until SPE failure was recorded for these tests. The final five tests were designed to measure SPE lifetime at tritium concentrations of 1, 10, and 100 Ci/ml. Lifetimes were 203, 49-111, and 22 days for the 1, 10 and 100 Ci/ml tests, respectively. DOE

N83-28145# Oak Ridge Y-12 Plant, Tenn.
SURFACE CHEMISTRY AND STRUCTURE OF BERYLLIUM OXIDE
E. L. Fuller, Jr., M. H. Eager, R. W. Smithwick, III, and N. R. Smyrl Feb. 1982 92 p refs
(Contract W-7405-eng-26)
(DE82-011844; Y/DK-282) Avail: NTIS HC A05/MF A01

Detailed examination of nitrogen sorption isotherm related to the surface chemistry and structure of high purity beryllium oxide and the products of alkali treatment aid in a better understanding of the topochemical problems encountered in the production of ceramic items. Details are corroborated by additional techniques: diffuse reflectance infrared Fourier transform (DRIFT); mercury intrusion porosimetry (MIP); and scanning electron microscopy (SEM). The results correlate well with studies on other oxides when the unique thermophysical properties of this material are considered. DOE

N83-28146# New Orleans Univ., La. Dept. of Chemistry.
IDENTIFICATION AND TEMPORAL BEHAVIOR OF RADICAL INTERMEDIATES FORMED DURING THE COMBUSTION AND PYROLYSIS OF GASEOUS FUELS: KINETIC PATHWAYS TO SOOT FORMATION Progress Report, 1 Sep. 1979 - 31 Aug. 1982
R. D. Kern, H. J. Singh, C. H. Wu, M. A. Esslinger, and P. W. Winkeler Mar. 1982 29 p refs
(Contract DE-AS05-79ER-10505)
(DE82-012775; DOE/ER-10505/3) Avail: NTIS HC A03/MF A01

The detection, identification, and concentration of intermediates and products formed during the pyrolyses of fuels that are known to produce soot is the primary focus. The decompositions of toluene, benzene, butadiene, and acetylene were analyzed. Product and reactant profiles were constructed during typical observation periods of one millisecond and spanned a temperature range of 1400 to 2300 K. The total carbon atom concentration was maintained at about 2 x 10 to the 17th power atoms/cubic cm. The apparatus employed consisted of a shock tube coupled to a time of flight mass spectrometer. Reacting gases were analyzed dynamically from the reflected shock zone. Spectra in the mass range m/e 12 to 300 were recorded at 30 micro sec intervals during the observation period. Numerous calibration experiments under no reaction shock conditions were performed with known concentrations of fuel compounds in order that the various peak heights recorded during pyrolysis could be placed on concentration vs. reaction time plots. DOE

N83-28147# General Electric Co., Schenectady, N. Y. Corporate Research and Development.
H2S REMOVAL FROM COAL GAS AT MID TEMPERATURE
B. M. Kim, S. G. Kimura, and J. A. Schultz 1982 36 p refs Presented at the AIChE Spring Natl. Meeting, Anaheim, Calif., 7-10 Jun. 1982
(Contract DE-AC01-80ET-15288)
(DE82-015161; CONF-820610-5) Avail: NTIS HC A03/MF A01

In certain coal gasification processes, the capability to scrub H2S from coal gas at quench/particulate scrubbing temperatures, typically 150 C to 200 C, would substantially reduce gas cleanup equipment costs, complexity and condensate handling requirements. Candidate absorbents were identified and evaluated. Those absorbents and their performance under realistic operating conditions with simulated coal gas are discussed. The benefits of midtemperature H2S scrubbing are summarized as follows up to 60% reduction in cleanup system capital cost and components; substantially reduced process and controls complexity; opportunity for scrubbing of sulfur compounds and NH3 in the same location; and elimination of the need for condensate handling and recycle, and potential emissions resulting from these operations. Based on the results obtained and the relative advantages over other processes, the direct oxidation process using stable inorganic catalysts appears to be most promising. DOE

N83-28148# University of Western Kentucky, Bowling Green. Dept. of Chemistry.
SUPPORTED TIN PHTHALOCYANINES AS CATALYSTS IN THE HYDROGENATION OF QUINOLINE
L. J. Boucher and E. J. Dadey 1982 14 p refs Presented at the 184th American Chemical Society Symp. on Coal Liquefaction, Kansas City, Mo., 12-17 Sep. 1982
(Contract DE-FG22-81PC-40812)
(DE82-016690; CONF-820909-6) Avail: NTIS HC A02/MF A01

The Tin(II) and Tin(IV) Phthalocyanines, (Sn(PC)) and (Sn(PC) Cl2), are active catalysts for the selective hydrogenation of Quinoline to 1,2,3,4, Tetrahydroquinoline at 200 to 250 C and 1000 psi H2 pressure. Both homogeneous and heterogeneous catalysts, supported on silica, show comparable activities. However, the stability of the catalysts is superior for the supported catalysts. Nonetheless both types of catalysts degrade at > 250 C by hydrogenation of the phthalocyanine macrocycle with concominant loss of metal. At 200 to 250 C the homogeneous catalysts undergo several reactions during the catalytic cycle, e.g., Sn(IV) is reduced to Sn(II) and (Sn(PC)2) is also formed. Further the phthalocyanine ring is slowly reduced. This is in contrast to the supported catalysts which just show reduction of the Sn(IV) complex. DOE

N83-28149# AeroChem Research Labs., Inc., Princeton, N. J.
RATE COEFFICIENTS OF COMBUSTION/FUEL CONVERSION REACTIONS BY HIGH-TEMPERATURE PHOTOCHEMISTRY Progress Report, 1 Jul. 1981 - 30 Jun. 1982
William Felder and Sasha Madronich Jun. 1982 11 p refs
(Contract DE-AC02-77ER-04169)
(DE82-018823; DOE/ER-04169/7; COO-4169-7) Avail: NTIS HC A02/MF A01

Reliable kinetic data on isolated, elementary combustion reactions spanning a broad temperature range are required for modeling and scaling studies aimed at improving the performance of, and reducing the pollutant formation from, fossil-fuel burning devices. Such data are generally not available. In the present work a new technique, High Temperature Photochemistry, was developed to provide such data. It combines the technology of the High-Temperature Fast-Flow Reactors developed to study kinetics of metal atom/oxide reactions in the 300 to 1900 K range with the flash photolysis technique, which although used widely for study of such combustion reactions, has previously been limited to studies at or near room temperature. Attempts to produce and detect CH3 radicals to perform kinetic studies of their oxidation by O2 and O atoms are discussed. Apparatus modifications and improvements have been made which greatly simplify obtaining data on OH reactions. DOE

N83-28150# Georgia Inst. of Tech., Atlanta.
DEVELOPMENT OF COAL-BURNING PULSATING COMBUSTOR FOR POWER GENERATION Annual Report
B. T. Zinn, N. Miller, J. A. Carvalho, Jr., and M. R. Wang May 1982 35 p refs
(Contract DE-AC22-79ER-10068)
(DE82-019138; DOE/ER-10068/T1) Avail: NTIS HC A03/MF A01

The burning of coal in a pulsating mode of combustion in a combustor whose design is based upon the Rijke tube principles was investigated. The combustor consists of a vertical tube opened at both ends with a fuel burning bed located in the middle of its lower half. In this configuration, the heat released by the combustion process spontaneously excites the fundamental, longitudinal acoustic mode of the tube. The combustor constructed under this program burns coal stably and continuously under either the self aspirating or the forced flow modes of operation. In the latter case, maximum amplitudes occur near stoichiometric air/fuel ratio operation, indicating that systems utilizing the developed combustor or a similar version should possess high thermal efficiencies. Additionally, it was verified that pulsating operating is possible for a variety of air/fuel ratios, including fuel rich conditions, which suggests that the developed combustor be used as a coal gasifier. DOE

N83-28151# Georgia Inst. of Tech., Atlanta. School of Aerospace Engineering.
DEVELOPMENT OF COAL-BURNING PULSATING COMBUSTOR FOR POWER GENERATION
B. T. Zinn, N. Miller, J. A. Carvalho, Jr., and M. R. Wang May 1982 36 p refs
(Contract DE-AC22-79ER-10068)
(DE82-018732; DOE/ER-10066/T2) Avail: NTIS HC A03/MF A01

Research conducted under this program consisted of an investigation of the burning of coal in a pulsating mode of combustion in a combustor whose design is based upon the Rijke tube principles. The combustor consists of a vertical tube opened at both ends with a fuel burning bed located in the middle of its lower half. In this configuration, the heat released by the combustion process spontaneously excites the fundamental, longitudinal acoustic mode of the tube. This study demonstrated that the combustor constructed can burn coal stably and continuously under either the self aspirating or the forced flow modes of operation. In the latter case, maximum amplitudes occur near stoichiometric air/fuel ratio operation, indicating that systems utilizing the developed combustor or a similar version should possess high thermal efficiencies. Additionally, it was verified that pulsating operation is possible for a variety of air/fuel ratios, including fuel rich conditions, which suggests that the developed combustor could be used as a coal gasifer. DOE

N83-28152# Los Alamos Scientific Lab., N. Mex.
SULFUR-ISOTOPE SEPARATION BY DISTILLATION
T. R. Mills 1982 3 p refs
(Contract W-7405-eng-36)
(DE82-018353; LA-UR-82-1599) Avail: NTIS HC A02/MF A01

Sulfur isotope separation by low temperature distillation of hydrogen sulfide was studied in an 8-m, 25-mm diameter distillation column. Column temperature was controlled by a propane propylene heat pipe. Column packing HETP was measured using nitric oxide in the column. The column was operated at pressures from 45 to 125 kPa. The relative volatility of S-32 vs. S-34 varied from 1.0008 to 1.0014. DOE

N83-28153# California Univ., Berkeley. Lawrence Berkeley Lab.
MOLECULAR BEAMS STUDIES OF THE ENERGETICS AND DYNAMICS OF ELEMENTARY CHEMICAL REACTIONS Ph.D. Thesis
Carl Clay Hayden May 1982 154 p refs
(Contracts DE-AC03-76SF-00098; N00014-75-C-0671)
(DE82-017054; LBL-13660) Avail: NTIS HC A08/MF A01

Quantum mechanical effects on the angular distribution of HF products from the F + H2 reaction were studied using crossed atomic and molecular beams with a rotatable mass spectrometer detector and time of flight velocity analysis. Measurement of the singlet triplet splitting of CH2 from the recoil velocities of fragments from ketene photodissociation in a molecular beam is also reported. Partial center of mass angular distributions and velocity flux contour maps have been derived for individual vibrational states of the HF product from the F + H2 reaction at collision energies of 2 and 3 kcal/mole. The center of mass distributions were obtained by analysis of laboratory angular and time of flight measurements of the reactive scattering. The results are consistent with recent three dimensional quantum mechanical scattering calculations, which predict that resonance effects should appear in the product angular distributions in this energy range. DOE

N83-28154# Mound Lab., Miamisburg, Ohio.
SURFACE CHANGE IN TITANIUM SUBHYDRIDE BETWEEN 25 AND 700 DEG C STUDIED BY AUGER ELECTRON SPECTROSCOPY AND X-RAY PHOTOELECTRON SPECTROSCOPY
Pu Sen Wang, Richard S. Carlson, and Tom N. Wittberg (Dayton Univ.) 9 Jul. 1982 12 p refs
(Contract DE-AC04-76DP-00053)
(DE82-018216; MLM-2955) Avail: NTIS HC A02/MF A01

The surface sensitive spectroscopic techniques of Auger electron spectroscopy and X-ray photoelectron spectroscopy were applied to the study of the oxide dissolution of titanium and titanium subhydride. In an earlier study, it was shown that the rate of oxygen dissolution into titanium increased sharply at approximately 350 C. These data correlated well with physical property measurements that indicated an exothermic reaction was occurring at these temperatures which corresponded to the reaction of free Ti with atmospheric oxygen. In the present study the work has been expanded to include studies of TiH/sub x/(x = 1.15, 1.62). It has been found that dissolution of the native oxide on titanium

subhydride occurs at a temperature substantially higher (approximately 500 C) than that required for titanium. It appears that the outward diffusion of hydrogen is inhibiting the inward diffusion of oxygen on the subhydride samples at temperatures below 500 C. DOE

N83-28155# Ames Lab., Iowa.
PARTIAL EQUILIBRIUM MODEL BASED ON THE KINETICS OF DISSOLUTION AND EQUILIBRIUM IN SOLUTION
C. C. Allen and R. G. Bautista 1982 42 p refs Presented at NATO Advan. Res. Inst. Conf. on Hydrometalurgical Processing, Cambridge, England, 25 Jul. 1982
(Contract W-7405-eng-82)
(DE82-019121; IS-M-392; CONF-820728-1) Avail: NTIS HC A03/MF A01

A mathematical model for determining the concentration changes in solution during the dissolution of a uranium dioxidepyrite mixture was developed using a Fe2(SO4)3-H2SO4 lixiviant. When modeling such a leaching process, the two different types of reactions which must be considered are the heterogeneous dissolution reactions and the homogeneous solution reactions. The dissolution reactions occur at kinetically limited reaction rates which are slow enough so that the rapid solution reactions are assumed to be at continual equilibrium. This situation allows for the partial equilibrium approach to be utilized to model the overall leaching process. The modeling process determines the equilibrium changes for all the species present in solution for every increment of solid dissolution, with the relative amount of uranium dioxide to pyrite reacting based on the experimentally determined rates of reaction. DOE

N83-28156# Ames Lab., Iowa.
POTENTIAL APPLICATIONS OF INDUCTIVELY COUPLED PLASMA ATOMIC SPECTROSCOPY TO THE ANALYSIS, CHARACTERIZATION AND MANAGEMENT OF NUCLEAR WASTES
M. C. Edelson and V. A. Fassel Apr. 1982 48 p refs
(Contract W-7405-eng-82)
(DE82-018628; IS-4796) Avail: NTIS HC A02/MF A01

Potential applications of the inductivity coupled plasma (ICP) to the analysis, characterization, and management of nuclear wastes are described. ICP methods for the determination of U and Pu are compared with gamma-ray spectroscopic methods and are shown to offer some advantages. The complexity of nuclear waste analysis demands that several analytical methods be employed and it is suggested that ICP techniques should be prominent among them. DOE

N83-28157# California Univ., Berkeley. Lawrence Berkeley Lab.
PHOTODISSOCIATION OF WATER BY P- AND N-TYPE POLYCRYSTALLINE IRON OXIDES USING VISIBLE LIGHT (> 2.7 eV) IN THE ABSENCE OF EXTERNAL POTENTIAL
C. Leygraf, M. Hendewerk, and G. A. Somorjai May 1982 11 p refs
(Contract DE-AC03-76SF-00098)
(DE82-018731; LBL-14494) Avail: NTIS HC A02/MF A01

A polycrystalline p/n diode assembly, consisting of pressed Mg- and Si-doped iron oxide powders, has been shown to photodissociate water using visible light in the absence of any external potential. In the investigated pH range (8 to 14) the device produces hydrogen catalytically in amounts which are readily detectable by gas chromatography. The relatively low power conversion efficient of 0.05% is believed to be due to the poor charge transfer properties of the p-type iron oxide used. DOE

N83-28158# California Univ., Los Angeles. School of Engineering and Applied Science.
DESIGN EVALUATION AND APPLICATION OF CONTINUOUS FLOW CELLS FOR ORGANIC ELECTROCHEMICAL SYNTHESIS Progress Report
K. Nobe 1982 27 p refs
(Contract DE-AC02-80ET-25207)
(DE82-012741; UCLA-ENG-P-5055-R-82) Avail: NTIS HC A03/MF A01

The strategy of paired electrochemical synthesis for the production of organic chemicals can result in as much as a 50% reduction in energy consumption, as compared to conventional electroorganic synthesis. A continuation of the research in paired synthesis, presently being conducted in this laboratory, is proposed. The future proposed work includes: (1) A continuing investigation into the chemistry of paired electroorganic reactions; (2) the engineering analysis and design of the electrochemical flow cell and separation equipment required for a synthesis; and (3) a bench scale pilot plant study and economic analysis of a synthesis. DOE

N83-28159# Pittsburgh and Midway Coal Mining Co., Englewood, Colo.
SOLVENT-REFINED-COAL (SRC) PROCESS. VOLUME 2, SECTIONS 5-14 Final Report
May 1982 537 p refs
(Contract DE-AC05-76ET-10104)
(DE82-013555; DOE/ET-10104/46-Vol-2) Avail: NTIS HC A23/MF A01

The completion of development work on the Solvent Refined Coal Process by the Pittsburgh and Midway Coal Mining Co. was documented. The work was initiated in 1966 under Office of Coal Research, US Department of Interior, Contract No. 14-01-0001-496 and completed under US Department of Energy Contract No. DE-AC05-79ET-10104. Work leading to the development of the SRC-1 and SRC-2 processes, construction of the Fort Lewis Pilot Plant for the successful development of these processes, and results from the operation of this pilot plant are discussed. Process design data generated on a 1 ton per day Process Development Unit, bench scale units and through numerous research projects in support of the design of major demonstration plants are also discussed in summary form and fully referenced. DOE

N83-28160# Washington State Univ., Pullman. Nuclear Radiation Center.
SOLVENT-REFINED-COAL (SRC) PROCESS: TRACE ELEMENTS. VOLUME 3: PILOT PLANT DEVELOPMENT WORK. PART 6: THE FATE OF TRACE ELEMENTS IN THE SRC PROCESS Final Research and Development Report
R. H. Filby, C. A. Grimm, V. Ekambaram, and M. L. Hunt Apr. 1982 213 p refs Prepared for Pittsburgh and Midway Coal Mining Co., Englewood, Colo.
(Contract DE-AC05-76ET-10104)
(DE82-013523; DOE/ET-10104/52-Vol-3-Pt-6; FRDR-53) Avail: NTIS HC A10/MF A01

The initial efforts concentrated on the development of appropriate analytical procedures for thirty-nine elements. Sensitive neutron activation procedures were developed for Ti, V, Ca, Mg, Al, Cl, Mn, As, Sb, Se, Hg, Br, Co, Ni, Cr, Fe, Na, Rb, Cs, K, Sc, Tb, Eu, Sm, Ce, La, Sr, Ba, Th, Hf, Ta, Ga, Zr, and Cu in feed coals, process solvent, SRC solid and liquid products, mineral residues, filter cake, by-product solvents, process and effluent waters, and by-product sulfur. Atomic absorption spectrophotometric procedures were developed for Pb, Cd and Be in various plant derived streams and materials including process and effluent waters. The bulk of the trace elements in the coal feed appear to concentrate in the mineral residue with two exceptions; bromine and titanium appear to concentrate in the SRC-1 solid product. High mercury, selenium and arsenic levels in the process water were effectively reduced by the treatment process to essentially natural levels. DOE

N83-28161# Pennsylvania State Univ., University Park. Coal Research Section.
RELATION OF COAL CHARACTERISTICS TO LIQUEFACTION BEHAVIOR. PART 1: OBJECTIVES, STRATEGIES AND FIRST SURVEY OF COALS Final Technical Report, Jul. 1976 - Feb. 1981
P. H. Given, W. Spackmen, A. Davis, H. L. Lovell, M. M. Coleman, and P. C. Painter May 1982 43 p refs
(Contract DE-AC22-76ET-10587)
(DE82-016996; DOE/ET-10587/T1-Pt-1; FE-2494-FR-1) Avail: NTIS HC A03/MF A01

Selection of coal feedstocks for liquefaction requires consideration of many characteristics. Moreover, one must also take various aspects of liquefaction behavior into account. To relate the two kinds of information was the principal objective of this study. A set of 104 coal samples was subjected to liquefaction in tetralin at 400 C in tubing bomb reactors. Cluster analysis, provided with liquefaction conversion and values for 14 properties of each coal, partitioned the sample set into three more homogeneous populations. These populations differed chiefly in range of rank, sulfur content and liquefaction conversion. The group including the coals of high sulfur content showed the highest yield of distillable liquid products, while the group of medium sulfur and relatively highrank coals showed the lowest proportion of pre-asphaltenes (i.e., toluene insolubles). The sulfur content of the total liquid product (including excess solvent) increased with the organic sulfur content of the coal used as feedstock. DOE

N83-28162# Delaware Univ., Newark. Dept. of Chemical Engineering.
DEVELOPMENT OF UNIQUE CATALYSTS FOR HYDRODENITROGENATION OF COAL-DERIVED LIQUIDS Final Report, 15 Sep. 1978 - 15 Sep. 1981
J. R. Katzer, A. B. Stiles, and H. Kwart 1 Feb. 1982 6 p refs
(Contract DE-AC22-78ET-11429)
(DE82-008384; DOE/ET-11429/T2) Avail: NTIS HC A02/MF A01

The objectives of the title research project involved four major tasks defined and summarized below. Briefly, the work was intended to optimize hydrodenitrogenation catalysts by adjusting the C-H bond formation and C-N bond scission functions. Model compounds (i.e., unsaturated multi-ring hetero-organics) were employed to best elucidate the catalyst's N-extraction function, to minimize hydrogenation, and to improve catalyst stability, especially with a view toward coal-derived liquids. The composition and preparation of the catalyst's is described. All were tested for C-N bond scission activity with model compounds. DOE

N83-28163# Brigham Young Univ., Provo, Utah.
INVESTIGATION OF SULFUR-TOLERANT CATALYSTS FOR SELECTIVE SYNTHESIS OF HYDROCARBON LIQUIDS FROM COAL DERIVED GASES
C. H. Bartholomew 30 Apr. 1982 26 p refs
(Contract DE-AC22-79ET-14809)
(DE82-018783; DOE/ET-14809/10) Avail: NTIS HC A03/MF A01

Samples of Fe, Ni, and Co boride catalysts, both supported and unsupported were prepared for magnetic measurement. Mossbauer spectra of two iron/silica catalysts derived from carbonyls revealed that higher metal dispersions can be obtained by this preparation technique. H2, CO, and O2 adsorption on these catalysts provided estimates of dispersion in the range of 10% or greater for these catalysts. Testing of iron/silica and iron boride catalysts at different temperatures in varying H2S concentrations was performed to determine poisoning kinetics. The Fe/SiO2 lost activity in proportion to the amount of H2S adsorbed while the iron boride catalyst showed no effects of deactivation in 6 ppM H2S over a period of five days. DOE

N83-28164# Wisconsin Univ., Madison.
STUDY OF THE PHYSICAL-CHEMICAL MECHANISMS AND VARIABLES WHICH AFFECT THE TRANSPORT OF INORGANIC AND ORGANIC MICROCONTAMINANTS IN HETEROGENEOUS SYSTEMS Technical Progress Report, 1 Jul. 1980 - 1 Jul. 1983
Marc A. Anderson, M. I. Tejedor-Tejedor, E. C. Yast, D. D. Hansmann, and R. R. Stanforth Jun. 1983 111 p refs
(Contract DE-AC02-80EV-10467)
(DE83-008991; DOE/EV-10467/T1) Avail: NTIS HC A06/MF A01

The dynamic interplay or competition that exists between aqueous solutions and solid surfaces for given solutes to predict, in time and space, movement or attenuation of organic and inorganic solutes in heterogeneous subsurface environments, is described. This competition determines the degrees of solute mobility for transport modeling. Competition is expressed simply as retardation factors. Results from the studies designed as research probes into the nature of interfacial reactions are reviewed: (1) phenol adsorption onto geothite; (2) electrostatic contributions in protolyzable anion adsorption; and (3) the effect of chemical and physical coagulation on the uptake of phosphorus by geothite. These studies represent state of the art contributions to the total level of effort being made by the research community in a rapidly expanding attempt. The adsorption of trace contaminants in heterogeneous systems is described. DOE

N83-28165# Pittsburgh and Midway Coal Mining Co., Englewood, Colo.
SOLVENT-REFINED-COAL (SRC) PROCESS. SRC-II FEEDSTOCK SCREENING METHODS Interim Report, 1 Jan. 1980 - 30 Sep. 1981
M. E. Prudich Jan. 1982 82 p refs
(Contract DE-AC05-76ET-10104)
(DE82-011500; DOE/ET-10104/31) Avail: NTIS HC A05/MF A01

The SRC-II Feedstock Screening Methods project has as its objective the development of a reliable method of feedstock screening for use in the selection and ranking of coals suitable for use in SRC-II processing. A comprehensive data base has been assembled which includes 123 SRC-II runs made feeding 37 different coals, batches of coals, or mixtures of coals in either the Merriam pilot unit or the P-99 PDU. These data were used to formulate correlative reactivity predictors for the total liquid product insoluble organic matter, and organic vacuum bottoms yields. In addition, a comparison was made between reactivities as determined by runs made on the 1/2-ton/day P-99 PDU and reactivities determined by runs made under a subcontract to the Pennsylvania State University using a continuous, 500-ml CSTR reactor. DOE

N83-28166# AeroChem Research Labs., Inc., Princeton, N. J.
THERMAL DECOMPOSITION OF EXPLOSIVES STUDIED BY CHEMILUMINESCENCE TECHNIQUES
H. N. Volltrauer 1982 18 p refs Presented at the Joint Symp. on Compatibility of Plastics and Other Material with Explosives, Phoenix, Ariz., 30 May 1982
(Contract DE-AC04-76DP-00789)
(DE82-013821; SAND-82-7031C; CONF-820518-4) Avail: NTIS HC A02/MF A01

The thermal decomposition rates of pentaerythritol-tetranitrate, PETN; hexanitrostilbene, HNS; and 2-(5-cyanotetrazolato) pentaamminecobalt(III) perchlorate, CP, have been investigated using a chemiluminescence NO/NO/sub x/ analyzer to detect decomposition products from these substances in real time. Samples were tested over various temperature ranges. DOE

N83-28167# California Univ., Livermore. Lawrence Livermore Lab.
COMPUTED AND EXPERIMENTAL INTERACTIONS BETWEEN EDDY STRUCTURE AND DISPERSED PARTICLES IN DEVELOPING FREE-SHEAR LAYERS
A. C. Buckingham, W. J. Siekhaus, J. O. Keller, J. Ellzey, G. Hubbard, and J. W. Daily 20 May 1982 17 p refs Presented at the AIAA/ASME Joint Conf. on Fluids, Plasma, Thermophys. and Heat Transfer., St. Louis, 7 Jun. 1982
(Contract W-7405-eng-48)
(DE82-015907; UCR-86936; CONF-820604-8) Avail: NTIS HC A02/MF A01

The interactive process between turbulent flow and dispersed phase particles were investigated. Focus was on the mechanisms that appear to result in a reduction of local turbulent intensity and a corresponding reduction in wall heat transfer and subsequent wall erosion in turbulent solid propellant combustion flow. Computational simulations and physical experiments were applied to a developing free shear layer over a rearward facing step and over a parallel splitter plate. The flow configuration evolves in a two dimensional, steady, combustion and non-combustion turbulent free

shear mixing region, with and without particle additives. The computational simulations combine three basic components: gas phase Navier-Stokes solutions, Lagrange particle field solutions and a Monte Carlo technique for the random encounters, forces and accelerations between the two fields. DOE

N83-28168# Erlangen-Nuremberg Univ. (West Germany). Inst. fuer Technische Chemie.
INVESTIGATIONS ON HYDROPYROLYSIS OF HEAVY CRUDE AND RESIDUAL OIL Final Report, Dec. 1981
Bernhard Schuetze Bonn Bundesministerium fuer Forschung und Technologie Feb. 1983 153 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-83-010; ISSN-0340-7608) Avail: NTIS HC A08/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 32

Hydropyrolysis of heavy crude and residual oil at temperatures above 500C and pressures below 50 bar was investigated. The reaction temperature was adjusted between thermal cracking and steam cracking, to give short-time hydropyrolysis in a spray reactor. Experiments show that the reactor behaves like a combination of a continuously stirred tank and a plug flow reactor. The hydropyrolysis produces an alkane-rich gas and a liquid rich in aromatics. With appropriate fluid dynamics coke production can be prevented. The conversion of the hydropyrolysis is in a range between hydrotreating and hydrocracking, however with considerable gasification. Author (ESA)

N83-28169# Technische Hogeschool, Delft (Netherlands). Dept. of Aerospace Engineering.
SOLID FUEL COMBUSTION CHAMBER: INITIAL PHASE Progress Report, Jul. 1982
H. F. R. Schoeyer and P. A. O. G. Korting Jun. 1982 22 p refs Prepared in cooperation with Prins Maurits Lab. TNO
(VTH-LR-354; PML-1982-134; PR-1) Avail: NTIS HC A02/MF A01

A solid fuel combustion chamber was tested with polymethyl methacrylate as a fuel and an N2/O2 mixture as gaseous oxidizer at 1 Mpa for 10 sec. The mixture ratio varied between 0,24 and 1,50 (by weight). At a mixture ratio 4 it is not possible to achieve sustained combustion. Experiments with a diaphgram show different regression behavior of the fuel. The regression rate was also determined ultrasonically. Swirl flow meter measurements show that the flow needs 5 sec before stationary conditions are achieved. The gas supply system is described. Author (ESA)

N83-28170# Technische Hogeschool, Delft (Netherlands). Dept. of Aerospace Engineering.
SOLID FUEL COMBUSTION CHAMBER: FIRST PHASE Progress Report 2, Jul. - Dec. 1982
H. F. R. Schoeyer, P. A. O. G. Korting, and J. B. Vos Dec. 1982 14 p refs Prepared in cooperation with Prins Maurits Lab. TNO (VTH-LR-363; PML-1982-159) Avail: NTIS HC A02/MF A01

A solid fuel combustion chamber was tested with polymethyl methacrylate as fuel and N2-O2 mixtures as gaseous oxidizer. The mixture ratio was varied between 100% O2 and 20% O2/80 % N2. At the latter mixture ratio sustained combustion is achieved. Where no combustion is achieved, the regression rate is pressure dependent, and is severely affected by oscillations. Although an ultrasonic technique to determine the local and instantaneous regression rate is promising, there are severe problems with data reduction and interpretation of the results. Tests with polyethylene as a fuel and pure oxygen as oxidizer were made. Radiation temperature measurements with a hybrid rocket engine are within 10% of the expected theoretical temperature. Author (ESA)

N83-28171# Ames Lab., Iowa.
EVALUATION OF THE ADSORPTION PROPERTIES OF SILICALITE FOR POTENTIAL APPLICATION TO ISOLATING POLAR LOW-MOLECULAR-WEIGHT ORGANICS FROM DRINKING WATER Project Summary Report, Sep. 1980 - Sep. 1981
Colin D. Chriswell, Douglas T. Gjerde, Gerda Shultz-Sibbel, James S. Fritz, and Ikue Ogawa Jan. 1983 31 p refs
(Contract EPA-68-03-2974)
(PB83-148502; EPA-600/1-83-001) Avail: NTIS HC A03/MF A01 CSCL 07D

Because of their high affinity for water, low molecular weight polar organic compounds are difficult to isolate from drinking water as a prelude to their identification and determination. Conventional isolation techniques such as solvent extraction, adsorption, gas purging and reverse osmosis yield only low recoveries when applied to small molecules with water-like chemical and physical properties. The chemical and physical properties of the adsorbent known as Silicalite were exploded, the characteristics of the molecular sieve for accumulating analytes from aqueous and from gaseous streams were elucidated, techniques were developed for recovering adsorbed organic materials from the molecular sieve adsorbent, and an analytical protocol was developed for determinig low molecular weight analytes such as dichloroacetonitrile in standard samples. GRA

N83-28172# Arizona Univ., Tucson. Dept. of Chemistry.
TOXIC COMPOUNDS FORMED BY THE CHLORINATION OF ARIZONA SURFACE WATERS
Michael A. Mikita, Kevin Thorn, Leslie Irwin, and Cornelius Steelink 1982 33 p refs
(Contract DI-14-34-0001-0103)
(PB83-150037; W83-01531; OWRT-A-094-ARIZ(1)) Avail: NTIS HC A03/MF A01 CSCL 07D

The two major organic constituents of drinking water, humic and fulvic acids, produce chloroform and other toxic halocarbons when they are chlorinated. Little is known about this reaction, because the chemical structures of these polymeric acids are obscure. A new method was developed for elucidating important structural features in these compounds. They reveal the nature and abundance of the phenolic, acidic and carbohydrate groups in humic and fulvic acids. These properties will help predict the interactions of humates with their chemical and aquatic environment and help classify humic materials on a rational, structural basis. Ozone has been proposed as an alternative disinfectant to chlorine. However, it is not known whether mutagenic compounds are produced by the ozonization of organic matter in water. Therefore, a study of the mutagenicity of a number of phenolic compounds was carried out, before and after ozone treatment. GRA

N83-28173# New Mexico State Univ., Las Cruces. Water Resources Inst.
MECHANISMS OF POLIOVIRUS INACTIVATION BY CHLORINE DIOXIDE AND IODINE AND THE EFFECTS OF CATIONS ON HALOGEN INACTIVATION
Marie E. Alvarez and R. T. OBrien Jun. 1982 66 p refs
(Contract DI-14-34-0001-1133)
(PB83-150102; WRRI-152; W83-01602; OWRT-A-066-NMEX(1)) Avail: NTIS HC A04/MF A01 CSCL 07D

Chlorine dioxide and iodine inactivated poliovirus most efficiently at pH 6. Sedimentation analyses of viruses inactivated by chlorine dioxide or iodine at pH 10 showed that viral RNA separated from the capsids converting the 156S virions to 80S particles. However, the separation of the RNA from the capsids was not the cause of virus inactivation. The rates of inactivation of poliovirus by halogen compounds, and the gross structural changes associated with virus inactivation, appear dependent on the pH of the reaction and on the ionic environment. GRA

N83-28174# Missouri Water Resources Research Center, Columbia. Water Resources Research Center.
COMPOSITION AND DEWATERING PROPERTIES OF BIOLOGICAL SLUDGES Final Report
John T. Novak and Bill D. Moore 13 Dec. 1982 92 p refs
(Contract DI-14-34-0001-1127)
(PB83-154385; W83-01792; OWRT-A-127-MO(1)) Avail: NTIS HC A05/MF A01 CSCL 07D

The role of biopolymer in sludge dewatering was determined.

Free biopolymer was measured as the high molecular weight fraction in the supernatant liquor fraction. As the fraction of high molecular weight material increased, sludge dewatering rates decreased. The resistance of filtration of activated sludge is due to or influenced by the high molecular weight fraction. The supernatant biopolymer also varied with pH. As the pH increased over the natural sludge pH, biopolymer levels increased. Lowering the pH reduced bipolymers. Biological floc contains large quantities of adsorbed biopolymer. Adsorption is pH sensitive, being strongest at pH levels near 3. Treatments which reduce biopolymer levels improve sludge dewatering and selective coagulation or precipitation of supernatant biopolymer appears the chief role of sludge conditioning agents. GRA

N83-28175# Louisiana Tech Univ., Ruston. Dept. of Chemical Engineering.

THM (TRIHALOMETHANES) PRECURSORS REMOVAL FROM SURFACE WATERS USING OZONE-HYDROGEN PEROXIDE OXIDATIONS

Joseph B. Fernandes Jul. 1982 21 p refs Sponsored in part by Louisiana Water Resources Research Inst.
(Contract DI-14-34-0001-1120)
(PB83-150300; W83-01626; OWRT-A-051-LA(1)) Avail: NTIS HC A02/MF A01 CSCL 07D

Trihalomethanes are formed when chlorine is used as a disinfecting agent in drinking water treatment plants. In order to reduce the formation of trihalomethanes, three alternatives are possible: the removal of precursors prior to chlorination; the removal of trihalomethanes after chlorination of water; or the use of disinfectants other than chlorine. In order to establish optimum conditions for trihalomethane precursor removal via hydrogen peroxide catalyzed ozonation, laboratory studies were carried out. Results indicate that the optimum value to obtain maximum removal of pecursors from natural water at a minimum ozone consumption level is 20 mg/l for hydrogen peroxide. The reduction in trihalomethanes is maximum at a pH value near 7. GRA

N83-28176# National Bureau of Standards, Washington, D.C. Center for Analytical Chemistry.

CHARACTERIZATION OF AIR PARTICULATE MATERIAL FOR POLYCYCLIC AROMATIC COMPOUNDS Final Report

S. A. Wise, C. F. Allen, S. N. Chesler, H. S. Hertz, L. R. Hilpert, W. E. May, R. E. Rebbert, and C. R. Vogt Jan. 1983 59 p refs Sponsored in part by Environmental Monitoring Systems Lab.
(PB83-155580; NBSIR-82-2595) Avail: NTIS HC A04/MF A01 CSCL 07D

The potential health and ecological effects of atmospheric emissions were evaluated. Bioassays were employed in conjunction with chemical characterization to correlate mutagenic and/or carcinogenic activity with chemical composition. The complexity of an air particulate extract necessitates the prefractionation of the mixture into suitable subfractures or chemical classes prior to chemical characterization and/or biological testing. A fractionation scheme for air particulate material with respect to chemical characterization of the various fractions with particular emphasis on the identification of polycyclic aromatic hydrocarbons (PAH) was evaluated. Three chromatographic approaches to separate, identify, and quantify the complex mixture of PAH extracted from SRM 1649 (Urban Dust/Organics) were used. GRA

N83-28177# Municipal Environmental Research Lab., Cincinnati, Ohio. Wastewater Research Div.

MONITORING AND ANALYSIS OF HAZARDOUS ORGANICS IN MUNICIPAL WASTEWATER: A STUDY OF TWENTY-FIVE TREATMENT PLANTS

Sidney A. Hannah and Lewis Rossman 3 Nov. 1982 36 p refs Presented at the Seminar on Hazardous Substance in Wastewaters, Toronto (Canada), 3 Nov. 1982
(PB83-155713; EPA-600/D-82-376) Avail: NTIS HC A03/MF A01 CSCL 07D

The Municipal Environmental Research Laboratory of the U.S. Environmental Protection Agency funded an extramural research program to develop sensitive analytical methods capable of analyzing municipal wastewaters and sludges for 114 organic priority pollutants and survey 25 publicly owned treatment works for the toxic organics. Development of the analytical methods and results of the survey are discussed. Plant selection criteria included plant size and type, geographical location and industrial contributions to the municipal wastewater. Raw wastewaters, primary effluents, final discharges and sludges were sampled. The majority of the plants were found to have between 20 and 50 priority organics in their raw influents and 10 to 30 priority organics in their final discharges. GRA

N83-28178# SRI International Corp., Menlo Park, Calif. Atmospheric Science Center.

MEASUREMENTS OF HAZARDOUS ORGANIC CHEMICALS IN THE AMBIENT ATMOSPHERE Final Report, Sep. 1978 - Oct. 1981

H. B. Singh, L. J. Salas, and H. Shigeishi Jan. 1983 99 p refs (Contract EPA-CA-805990)
(PB83-156935; SRI-7774; EPA-600/3-83-002) Avail: NTIS HC A05/MF A01 CSCL 07D

Analytical methods were refined and applied to the ambient analysis of 44 organic chemicals, many of which are bacterial mutagens or suspected carcinogens. On site field collection programs, based on single site studies of 9 to 11 days duration each, were conducted. Field studies were performed with an instrumented mobile laboratory. A round the clock measurement schedule was followed at all sites. field measurements allowed a determination of atmospheric concentrations, variabilities, and mean diurnal behaviors of the chemicals. The analyzed relative to theoretically estimated removal rates. Typical diurnal profiles show highest concentrations of the primary pollutants during nighttime or early morning hours, with minimum concentrations in the afternoon hours. GRA

N83-28598# Teledyne Energy Systems, Timonium, Md.

ADVANCED ALKALINE WATER ELECTROLYSIS DEVELOPMENT OF AN ELECTROLYSIS CELL SEPARATOR FOR 125 C OPERATION

John N. Murray *In* Courtesy Assoc., Inc. Proc. of the DOE Phys. and Chem. Storage Ann. Contractors' Rev. Meeting Dec. 1982 p 74-79 refs (For primary document see N83-28586 17-44)
Avail: NTIS HC A25/MF A01

N83-28599# General Electric Co., Wilmington, Mass. Electrochemical Energy Conversion Program Office.

STATUS OF THE DEVELOPMENT OF SOLID POLYMER ELECTROLYTE WATER ELECTROLYSIS FOR LARGE SCALE HYDROGEN GENERATION

James F. McElroy *In* Courtesy Assoc., Inc. Proc. of the DOE Phys. and Chem. Storage Ann. Contractors' Rev. Meeting Dec. 1982 p 80-84 (For primary document see N83-28586 17-44)
Avail: NTIS HC A25/MF A01

26 METALLIC MATERIALS

Includes physical, chemical, and mechanical properties of metals, e.g., corrosion; and metallurgy.

N83-28179# United Kingdom Atomic Energy Authority, Risley (England).

STEEL SURFACE TREATMENT AGAINST FRICTION WEAR, NEW BORON DEPOSIT TECHNIQUE

P. Goeuriot, F. Thevenot, and J. Driver 1980 8 p refs Transl. into ENGLISH of paper presented at the Intern. Colloq. on Hardfacing Mater. in Nucl. Power Plants, 1980 Colloq. held 25-26 Sep. 1980
(BLL-Risley-Tr-4361-(9091.9F)) Avail: British Library Lending Div., Boston Spa, Engl.

An original process allowing the bonding of carbon steels (monophase layer Fe2B) and alloy steels up to tool steels (good adhesion) with complete reliability was developed. As with known processes, the boride surface treatment of the austenitic steel

Z6CN18-10 remains problematical. From the industrial point of view, the advantages of the process are considerable: simplicity, flexibility, and economy of hand operations. The raw material costs are reduced by about five and the operations are reduced to a minimum. Gaseous phase boride deposition is made even more advantageous. Author

N83-28180# United Kingdom Atomic Energy Authority, Risley (England).
THE SUPER ALLOYS, CENIUM
A. Balleret 1980 10 p Transl. into ENGLISH of paper presented at the Intern. Colloq. on Hardfacing Mater. in Nucl. Power Plants, 1980 Colloq. held 25-26 Sep. 1980
(BLL-Risley-Tr-4359-(9091.9F)) Avail: British Library Lending Div., Boston Spa, Engl.

High endurance Cenium alloys, and friction tests, are addressed. Author

N83-28181 Washington Univ., Seattle.
DEFORMATION AND FRACTURE OF Cu-BASE ALLOYS UNDER DYNAMIC LOADING CONDITIONS Ph.D. Thesis
Kriahna V. Rao 1982 294 p
Avail: Univ. Microfilms Order No. DA8226590

The deformation substructures and fracture characteristics of Cu-Si and Cu-Co alloys are investigated over a range of strain rates using transmission and scanning electron microscopy techniques. Examination of the microstructures resulting from biaxial dynamic loading of Cu-4.67% Si alloys has revealed strain induced k phase and deformation twins. The deformation substructure also exhibits the presence of microvoids preferentially along the alpha k coherent interfaces. A close agreement between the average intervoid spacing and the ledge spacing along the alpha k interfaces has lead to the conclusion that incoherent ledges along otherwise coherent interfaces offer preferred sites for the nucleation of voids under dynamic loading conditions. The effect of second phase dispersions on deformation structure were investigated. On the basis of the observed precipitate growth, coherency loss, and the microvoids in the Cu-Si alloy, it was argued that a large number of excess vacancies with rapid migration rates are generated during dynamic loading. Dissert. Abstr.

N83-28182 Northwestern Univ., Evanston, Ill.
A MECHANISM FOR CO-PLANAR DOUBLE SLIP AND PLASTIC DEFORMATION OF PURE AND OXYGEN-DOPED NIOBIUM SINGLE CRYSTALS AT 77K Ph.D. Thesis
Gun Woong Bang 1982 320 p
Avail: Univ. Microfilms Order No. DA8225874

A model to rationalize tensile axis orientation dependence of plastic deformation of niobium single crystals at low temperatures was developed, utilizing the observation of coplanar double slip operating not only on the anomalous slip plane but also on the primary and conjugate slip planes. When two screw dislocations approach each other, a double kink is easily formed on the common plane due to a torque force developed by the interaction between the dislocations. Two criteria are proposed for the operation of coplanar double slip: (1) the most probable slip plane is the common plane of the first and second highly stressed screw dislocations, (2) the applied shear stress on the common plane should be large enough to move kinks laterally. Applying the criteria, the standard stereographic triangle can be divided into four distinct regions of different slip systems. The yield stress can be predicted for various orientations. The predicted slip systems and yield stresses were in an excellent agreement with the experimental results. Dissert. Abstr.

N83-28183 Northwestern Univ., Evanston, Ill.
SINTERING AND SURFACE SMOOTHING STUDIES ON NICKEL AND NICKEL WITH DISPERSED OXIDE PARTICLES Ph.D. Thesis
Nick Matthew Sbrockey 1982 170 p
Avail: Univ. Microfilms Order No. DA8226009

Sintering studies were performed on nickel powders with and without aluminum oxide second phase particles at 750 C, in hydrogen environments. The presence of Al2O3 in concentrations as low as 2.5 volume per cent was found to strongly retard nickel surface area loss due to sintering. In similar experiments on nickel powders with dispersed Cr2O3 particles, reduction of much of the chroma was observed. The remaining particles and the resulting metallic chromium alloyed with the nickel were found to have no measureable effect on the sintering rate. Surface smoothing results obtained from pure nickel crystals yielded estimtes of the surface self-diffusion coefficient on the (100) plane, in the temperature range 750 C to 1016 C. These were found to agree with extraplotions of reported higher temperature data. These experiments were repeated with aluminum oxide particles desited directly on the nickel crystal surface. The presence of dispersed Al2O3 particles was found to retard the surface smoothing kinetics at 885 C. The amplitude decay rate varied inversely with the surface concentration of particles. Dissert. Abstr.

N83-28184 Michigan Univ., Ann Arbor.
HIGH TEMPERATURE ELECTRICAL CONDUCTIVITY OF ALUMINUM NITRIDE Ph.D. Thesis
Von Lee Richards, II 1982 206 p
Avail: Univ. Microfilms Order No. DA8225029

Total electrical conductivity measurements were made by the four-pole D.C. method on hot pressed polycrystalline aluminum nitride doped with oxygen and with both beryllium and oxygen. Conductivity was observed to decrease with the addition of beryllium. In all cases, conductivity was observed to be independent of nitrogen partial pressure. The activation energy for conduction in oxygen-doped aluminum nitride was 1.45 eV, while in aluminum nitride doped with beryllium and oxygen it was 1.83 eV. Analysis of the conductivity results in terms of defect chemistry models indicates extrinsic electrons, or, intrinsic or extrinsic aluminum vacancies as the predominant carrier species in oxygen-doped aluminum nitride. Comparison of the measured partial electronic conductivity of oxygen-doped aluminum nitride with results obtained from a known solid oxide electrolyte indicate an electronic transference number near unity. Dissert. Abstr.

N83-28185 Northwestern Univ., Evanston, Ill.
HIGH TEMPERATURE FATIGUE CRACK PROPAGATION IN A NICKEL BASE SUPERALLOY AND INVESTIGATION OF THE INTERGRANULAR FRACTURE PROCESS Ph.D. Thesis
Brad Lee Kirkwood 1982 179 p
Avail: Univ. Microfilms Order No. DA8225952

The high temperature fatigue behavior of a nickel base superalloy was studied to determine the effect of grain boundary cavitation on the crack propagation rate. It was found that the introduction of cavities into a specimen prior to the fatigue test increases the crack propagation rate significantly over specimens which did not have cavities introduced into them. Companion fatigue specimens were cycled under similar conditions until they attained different levels of cyclic stress intensity in order to observe the changes that occur in the cavity spacing within the plastic zone as the stress intensity increases. The cavity spacing was observed with shadowed two stage TEM replicas taken from the plastic zone near the crack tip. It was found that the cavities nucleate continuously throughout the test, with the cavity spacing becoming progressively smaller as the cyclic stress intensity increases. It also was found that the cavity spacing decreases as one goes through the plastic zone toward the crack tip. A computer analysis of the diffusional growth rate of a void in the plastic zone was done to determine a theoretical value of the minimum cavity spacing which would give the observed crack propagation. Dissert. Abstr.

N83-28186# British Library Lending Div., Boston Spa (England).
PORE DIMENSIONS AND THE ANGLE OF WETTING OF A REFRACTORY LINING WITH METAL
G. N. Elanskii, V. A. Kudrin, V. T. Karpeshin, A. V. Popov, E. I. Tyurin, and V. S. Pemrov 30 Mar. 1983 10 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Chernaya Met. (USSR), v. 3, 1982 p 41-47
(BLL-M-26924-(5828.4)) Avail: British Library Lending Div., Boston Spa, Engl.

The maximum radii of pores not filled with molten metal in refractory linings were calculated with relation to the angle of wetting and the depth of the bath. Macromarginal angles of wetting were calculated from the activity of the oxygen in the layer of metal on a furnace hearth, measured with a direct action activometer; during refining, these angles vary between 94 and 129 deg. An equation was derived making it possible to calculate the minimum oxygen activity in the metal necessary for bubbles of carbon monoxide to be formed in the pores. Author

N83-28187# British Library Lending Div., Boston Spa (England).
SEMINAR OF MEMBER COUNTRIES OF COMECON: STATE AND PROSPECTS FOR DEVELOPMENT OF PRODUCTION AND UTILIZATION OF WELDED STRUCTURAL STEELS OF INCREASED STRENGTH
Miroslav Feikus 14 Apr. 1983 8 p Transl. into ENGLISH from Stal (USSR), no. 4, 1982 p 82-83
(BLL-M-26961-(5828.4)) Avail: British Library Lending Div., Boston Spa, Engl.

The investigation, production, and utilization of welded structural steels with increased service property indices is addressed. It is hoped that this work will lead to considerable savings of metal. A brief outline is given of the addresses given. The need for a common conception of standardization of structural steels was emphasized in the resolution passed by the seminar. Author

N83-28188 Georgia Inst. of Tech., Atlanta.
EFFECTS OF PRECIPITATION HEAT TREATMENT ON THE MICROSTRUCTURE, TOUGHNESS AND STRESS CORROSION CRACK PROPAGATION RESISTANCE OF ALUMINUM ALLOY 2020 Ph.D. Thesis
John George Rinker 1982 98 p
Avail: Univ. Microfilms Order No. DA8229903

The effects of precipitation heat treatment on the microstructure, toughness, and stress corrosion crack propagation resistance of aluminum alloy 2020 were investigated. Precipitation strengthening was found to be due to extensive co-precipitation of the theta prime (Al2Cu) and T sub 1 (Al2CuLi) phases. Although some evidence of delta prime precipitation was also found, no significant contribution to strengthening was attributed to this phase. The stress corrosion cracking (SCC) resistance of 2020 in the peak strength temper and several high strength underaged tempers was excellent. Poor SCC resistance was observed for a very underaged temper. A model was proposed in which the variation in the stress corrosion resistance of 2020 with precipitation heat treatment is controlled by the electrochemical potential difference between grain boundary T sub 1, precipitates and the interior of grains. The SCC resistance of high strength underaged tempers is very high because this potential difference is minimized at a relatively early stage of aging. Dissert. Abstr.

N83-28189# British Library Lending Div., Boston Spa (England).
EXPANSION OF STRIPS DURING HEAT-TREATMENT ON CONTINUOUS PLANT
A. S. Gurov and G. G. Grigoryan 14 Apr. 1983 5 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Chernaya Met. (USSR), v. 3, 1982 p 60-62
(BLL-M-26926-(5828.4)) Avail: British Library Lending Div., Boston Spa, Engl.

Methods employing creep mechanics are enlisted for mathematically describing the elastic expansion of rolled strips during heat treatment on continuous units. More accurate procedures are established for tensioning the strips during heat treatment with the tower furnaces. Shape defects, characterized by undulation amplitude-to-length ratios A/l < mm/m, can be completely eliminated by straightening during annealing in tower furnaces, the possible strip tensions established for this purpose being 12 to 25 MPa at 650 C, 5 to 12 MPa at 750 C and 2 to 2.5 MPa at 850 C. Author

N83-28190# British Library Lending Div., Boston Spa (England).
DISPLACEMENT IN ESTIMATION OF LENGTH OF COIL WITH TEMPERATURE WEDGE
L. A. Zueva and I. A. Mochalov 30 Mar. 1983 7 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Chernaya Met. (USSR), v. 3, 1982 p 62-66
(BLL-M-26927-(5828.4)) Avail: British Library Lending Div., Boston Spa, Engl.

Long coils (n is approximately 400, where n represents the number of laps) with wedge configurations of tan alpha = 10 to the minus 10th power to 2 x 10 to the minus 8th power and h sub 0 = 1 to 5nm (h sub 0 representing the thickness of the strip) the error (displacement) of the strip length with an algorithm, in which the mathematical model assumes there is no wedge configuration, no greater than 0.3 to 4 m. A coil wrap length (CWL) algorithm of this type is therefore avisable, such error being within acceptable limits. Author

N83-28191# British Library Lending Div., Boston Spa (England).
OSCILLATIONS OF ELECTRON DENSITY IN DILUTE SOLID SOLUTIONS BASED ON ALPHA-Fe
Yu. S. Stark, A. Sh. Chavchanidze, and I. S. Shpotin 30 Mar. 1983 10 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Chernaya Met. (USSR), v. 3, 1982 p 87-91
(BLL-M-26930-(5828.4)) Avail: British Library Lending Div., Boston Spa, Engl.

A calculating method is proposed, permitting the accurate determination of the parameters of spin density oscillation from experimentally obtained displacements of the hyperfine field in alpha-Fe around the impurities V, Cr, Mn, Co and Ni. A further possible improvement of this model is proposed, utilizing nonasymptotic expressions for the redistribution of electron spin density and an approximation of phase displacements of scattering theory. Author

N83-28192# British Library Lending Div., Boston Spa (England).
SIMULATION AND IDENTIFICATION OF THE INGOT-HEATING PROCESS IN SOAKING PITS
G. V. Trubitsyn 30 Mar. 1983 6 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Chern. Met. (USSR), v. 3, 1982 p 136-138
(BLL-M-26932-(5828.4)) Avail: British Library Lending Div., Boston Spa, Engl.

The computer simulation and identification of the ingot-heating process in soaking pits is considered. It is concluded that identification requires information about the variation of the effective temperature characterizing the heating phase and the surface temperature of ingots during heating. The time which this information is obtained must be at least 40% of the total ingot-heating time. The proposed mathematical model is sufficiently accurate for practice and can be used for solving a number of control problems for such processes. Author

N83-28193# British Library Lending Div., Boston Spa (England).
CORRELATION OF FLATNESS CRITERIA IN SHEET ROLLING
Ya. N. Vydrin, N. V. Sudakov, and E. A. Ostsemin 14 Apr. 1983 6 p refs Transl. into ENGLISH from Izv. (USSR), v. 4, 1982 p 79-82
(BLL-M-26969-(5828.4)) Avail: British Library Lending Div., Boston Spa, Engl.

The connection between the deformation flatness criterion and kinematic flatness criterion was demonstrated. The deformation flatness criterion is a particular case of the kinematic flatness criterion and valid for particular cases of rolling only. The particular case of rolling and indices, which will determine the flatness of the strips, are examined. Author

N83-28194# British Library Lending Div., Boston Spa (England).
OPTIMAL CONTROL OF METAL HEATING (COOLING) AND SOLIDIFICATION PROCESSES
V. I. Panferov 14 Apr. 1983 6 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Chernaya Met. (USSR), v. 4, 1982 p 129-132
(BLL-M-26975-(5828.4)) Avail: British Library Lending Div., Boston Spa, Engl.

The results of a theoretical investigation on the optimal control

of distributed processes with a moving boundary are given as they apply to the control of metal heating (cooling) and solidification processes. The necessary conditions of optimality of process control are obtained. With some modification the results obtained can also be used for the optimal control of the melting of metal covered by a layer of melt. Author

N83-28195# British Library Lending Div., Boston Spa (England).
TEMPERATURE FIELD OF TOOL COOLED BY FLOW COOLANT
B. F. Trakhtenberg, E. O. Tikhonova, and M. S. Kenis 1982 8 p ref Transl. into ENGLISH from Izv. Vyssh. Uch. Zaved., Chernaya Met. (USSR), v. 3, 1982 p 82-86
(BLL-M-20924-(5828.4)) Avail: British Library Lending Div., Boston Spa, England

An examination is made of the cyclic thermal problem for the non-steady state stage of operation of a tool for hot deformation when a flow coolant is used. The solution obtained can be used for analysis of the influence of the individual parameters of the cycle and the geometry and thermophysical properties of the tool on the temperature field of the tool. Author

N83-28196# British Library Lending Div., Boston Spa (England).
THERMODYNAMIC ACTIVITY OF VANADIUM IN LIQUID IRON
Yu. V. Balkovoi, R. A. Aleev, and V. A. Grigoryan 1982 3 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Chernaya Met. (USSR), v. 3, 1982 p 151
(BLL-M-26960-(5828.4)) Avail: British Library Lending Div., Boston Spa, Engl.

The activity coefficient of vanadium was determined from an equation relating the relative losses of iron u prime sub Fe and vanadium v prime sub V to the distillation coefficient. The iron activity was determined by vaporization from an open surface in vacuum. Vapor pressure data are taken from the literature, and expressions are derived which are valid for vanadium concentrations o < or = n sub v < or = 0.554. Author

N83-28197# British Library Lending Div., Boston Spa (England).
STEELS WITH REDUCED HARDENABILITY MELTED IN CONVERTERS
A. P. Nekrasov, V. G. Vinokurov, V. A. Popov, and D. B. Foigt 1982 3 p Transl. into ENGLISH from Stal (USSR), v. 4, 1982 p 24
(BLL-M-20947-(5828.4)) Avail: British Library Lending Div., Boston Spa, Engl.

The technology for melting of 55pp steel is described. B.G.

N83-28198# British Library Lending Div., Boston Spa (England).
A SEMINAR ON THE TECHNOLOGY FOR TREATING STEEL WITH POWDERED MATERIALS
A. F. Kablukovskii and I. E. Melnikova 1982 3 p Transl. into ENGLISH from Stal (USSR), v. 4, 1982 p 40
(BLL-M-26952-(5828.4)) Avail: British Library Lending Div., Boston Spa, Engl.

The development of a technology for refining steel outside the furnace was discussed. Of particular interest was vacuum degasification, furnace ladle methods coupled with gas lancing the metal and treatment with powdered reagents. Author

N83-28199# British Library Lending Div., Boston Spa (England).
STATE AND PROSPECTS OF PRODUCTION AND UTILIZATION OF IRON AND ALLOY POWDERS
L. Kh. Strokovskii and V. B. Akimenko 1982 6 p Transl. into ENGLISH from Stal (USSR), v. 4, 1982 p 84-85
(BLL-M-26962-(5828.4)) Avail: British Library Lending Div., Boston Spa, Engl.

Problems concerning current production of iron and alloy powders, the use of powders in welding, the production of articles from powders, and the use of powders for applying coatings were addressed. Author

N83-28200 Universitaire Instelling Antwerpen, Wilrijk (Belgium).
INVESTIGATION OF ORDERING IN THE Au-11Mn-4 ALLOY SYSTEM BY MEANS OF HIGH RESOLUTION ELECTRON MICROSCOPY AND DIFFRACTION Ph.D. Thesis
Roman Wolf 1982 189 p
Avail: Univ. Microfilms Order No. DA8270072

In the framework of a research program of the Au-Mn alloy system, special attention was paid to the Au11Mn4 alloy. It was discovered in 1964 as an unknown stable phase and therefore named 'X-phase'. About 10 years later, the structure was determined to be very complex with 810 atoms in the unit cell. The relation between this structure and the phases from which it originates remained hitherto unknown. By applying high resolution electron microscopy and electron diffraction to the simpler structure of Au5Mn2, an image code was developed by comparison with computed images; it was used successfully in the investigation of the Au11Mn4 alloy. After annealing for different time periods, the alloys were prepared for electron microscopic investigation by electropolishing. Different intermediate structures were found, most of which belonging to the cubic system. The crystallographic aspects of their formation were deduced from the analysis of image and diffraction data. Dissert. Abstr.

N83-28201 Denver Univ., Colo.
ACOUSTIC EMISSION IN MAGNESIUM AND TITANIUM Ph.D. Thesis
Mark Alexander Friesel 1982 240 p
Avail: Univ. Microfilms Order No. DA8229115

The acoustic emission produced during deformation of AZ31B magnesium and alpha-titanium was investigated in order to identify the deformation processes responsible for the emission. Both magnesium and titanium specimens were deformed at constant strain rate while simultaneously measuring the load on the specimen, extension of the sample, RMS voltage, energy rate, event rate, ringdown count rate, signal amplitude, and for some titanium tests, the test temperature. Twinning was observed to be accompanied by burst-type emission in magnesium and titanium, and additionally showed relatively high energy per event ratios. Emission from dislocations was primarily continuous and produced low energy per event ratios. Dissert. Abstr.

N83-28202 Defence Research Information Centre, Orpington (England).
RELATIONSHIP BETWEEN STRUCTURE AND IMPACT STRENGTH IN AS-SOLIDIFIED WELDS OF MILD AND LOW ALLOY STEELS
C. Bonnet Dec. 1982 40 p refs Transl. into ENGLISH from Soudage et Tech. Connexes (France), 1980 p 209-230
(DRIC-T-6775; BR86349) Copyright. Avail: Issuing Activity

The mechanical characteristics of the fusion zone of butt welds are studied. The quantification of the influence of heat cycle and chemical composition is discussed. The dimensions of the pro-entectoide ferrite lattice and the proportion of acicular ferrite are particularly relevant in determining the impact strength characteristics. It is shown that there is an optimum in the chemical equilibrium due to contradictory effects related to the addition of alloying elements: the increase in hardenability and thus the proportion of circular ferrite, and the hardening through solid solution effect. Although a prediction of impact properties is not possible, guidance in the choice of welding products by examination of the structure in the fusion zone can be obtained. Author (ESA)

N83-28203 National Physical Lab., Teddington (England). Div. of Materials Applications.
CATHODIC PROTECTION OF STEEL IN SEA WATER UNDER HEAT-TRANSFER CONDITIONS
P. E. Francis and A. S. Dolphin Jun. 1982 48 p refs
(NPL-DMA(A)-55; ISSN-0143-7313) Copyright. Avail: Issuing Activity

The effect of heat transfer on the parameters required for cathodic protection of steel in sea water were investigated. ASTM sea water was used for the study to ensure comparability between results. Heat transfer was varied by changing the internal temperature of the specimens between ambient and 110 C. The temperature of the water was either 5 or 20 C with linear

flow velocities past the specimens of 5 or 50 cm per sec. Under most conditions calcareous deposits which formed on the specimens were nonporous to oxygen and the cathodic currents were due to the reduction of water, but on precorroded surfaces the deposits were more porous so that cathodic currents were increased by oxygen reduction at the surface of the metal. The minimum cathodic potential required for protection of the steel specimens was not changed by heat transfer, and the corrosion rate was negligible at potentials more negative than -775 mV/Ag/AgCl) under all conditions. Author (ESA)

N83-28204*# Massachusetts Inst. of Tech., Cambridge. Dept. of Chemical Engineering.
CARBON DEPOSITION IN THE BOSCH PROCESS WITH RUTHENIUM AND RUTHENIUM-IRON ALLOY CATALYSTS M.S. Thesis. Final Report, Jan. 1981 - Jul. 1982
Michael P. Manning, Robert C. Reid, and Chartsiri Sophonpanich Dec. 1982 122 p refs
(Grant NAG2-90)
(NASA-CR-172699; NAS 1.26:172699) Avail: NTIS HC A06/MF A01 CSCL 11F

The effectiveness of ruthenium and the alloys 50Ru50Fe and 33Ru67Fe as alternatives to iron, nickel, and cobalt catalysts in recovering oxygen from metabolic carbon dioxide was investigated. Carbon deposition boundaries over the unsupported alloys are reported. Experiments were also carried out over 50Ru50Fe and 97Ru3Fe3 catalysts supported on gamma-alumina to determine their performance in the synthesis of low molecular weight olefins. High production of ethylene and propylene would be beneficial for an improvement of an overall Bosch process, as a gas phase containing high olefin content would enhance carbon deposition in a Bosch reactor. A.R.H.

N83-28205# British Library Lending Div., Boston Spa (England).
THEORETICAL ANALYSIS OF CONTACT FORCE REACTION DURING EXTRUSION
I. N. Potapov, V. F. Balakin, Yu. G. Gulyaev, and E. A. Svistunov 1982 6 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Chernaya Met. (USSR), v. 3, 1982 p 56-60
(BLL-M-20925-(5828.4)) Avail: British Library Lending Div., Boston Spa, Engl.

The possible conditions of contact reaction during hydraulic extrusion are analyzed on the basis of simulation of the differential equations for equilibrium between the liquid and metal in the deformation zone. The possibility of the presence of zones of desparately oriented contact friction forces on the deformation zone is demonstrated. Author

N83-28206# Argonne National Lab., Ill. Materials Science and Technology Div.
SOLUTION HARDENING AND STRAIN HARDENING AT ELEVATED TEMPERATURES
U. F. Kocks Oct. 1982 28 p refs Presented at the Am. Soc. of Metals Meeting, St. Louis, 23-24 Oct. 1982
(Contract W-31-109-eng-38)
(DE83-007745; CONF-8210116-2) Avail: NTIS HC A03/MF A01

Solutes can significantly increase the rate of strain hardening; as a consequence, the saturation stress, at which strain hardening tends to cease for a given temperature and strain rate, is increased more than the yield stress: this is the major effect of solutes on strength at elevated temperatures, especially in the regime where dynamic strain aging occurs. It is shown that local solute mobility can affect both the rate of dynamic recovery and the dislocation/dislocation interaction strength. The latter effect leads to multiplicative solution strengthening. A new model based on repeated dislocation unlocking, in a high-temperature limit, which also rationalizes the stress dependence of static and dynamic strain aging, helps to explain the plateau of the yield stress at elevated temperatures. Author

N83-28207# British Library Lending Div., Boston Spa (England).
ROLLING WITH HIGH REDUCTIONS: A PROMISING NEW LINE IN METAL PRESSURE WORKING
P. K. Teterin, V. A. Matorin, and A. N. Skornyakov 1982 10 p refs Transl. into ENGLISH from Stal (USSR), v. 3, 1982 p 58-60 (BLL-M-26918-(5828.4)) Avail: British Library Lending Div., Boston Spa, Engl.

The evolution of rolling with high reductions since the first planetary mill was mastered abroad in the 1950's is considered. The principles of the main types of high-reduction mills in industrial use are outlined, together with experience in their operation and their special features. Considerable attention is given to the scope for linking continuous casting with high-reduction rolling for flat products and sections and to the advantages of high-reduction rolling. Author

N83-28208*# Case Western Reserve Univ., Cleveland, Ohio. Dept. of Civil Engineering.
SOLUTION OF ELASTIC AND ELASTO-PLASTIC PROBLEMS BY THE METHOD OF LINES Final Report
Alexander Mendelson and Javed Alam Apr. 1983 350 p refs
(Grant NsG-3251)
(NASA-CR-168125; NAS 1.26:168125) Avail: NTIS HC A15/MF A01 CSCL 11F

The solution of a crack problem by the method of lines, the solution of elasto-plastic problem using the method of lines, and the stress intensity factors and J-integral determination are discussed. Author

N83-28209# California Univ., Davis. Dept. of Mechanical Engineering.
FUNDAMENTAL INVESTIGATIONS OF FAILURE DURING SUPERPLASTIC FORMING PROCESS Annual Technical Report, 1 Feb. 1982 - 31 Jan. 1983
Amiya K. Mukherjee, Giora Guerwitz, and Michael Meier 7 Feb. 1983 38 p refs
(Grant AF-AFOSR-0081-82; AF Proj. 2306)
(AD-A125707; AFOSR-83-0106TR) Avail: NTIS HC A03/MF A01 CSCL 11/6

The mechanical and microstructural aspect of superplastic deformation in Ti-6Al-4V alloy was investigated with special emphasis given to cavitation phenomenon. The contribution of grain growth and grain refinement in affecting the flow stress at a given temperature and strain rate was noted. Cavities nucleate and grow mostly at temperature below 850 degrees C. Above 900 degrees C cavity nucleation was almost nonexistent due to higher volume fraction of the soft deformable B phase in the microstructure. Author (GRA)

N83-28210# Naval Research Lab., Washington, D. C.
ASSESSMENT CRITERIA FOR ENVIRONMENTAL CRACKING OF HIGH-STRENGTH STEELS IN SEAWATER Final Report
T. W. Crooker and J. A. Hauser, II 18 Mar. 1983 24 p refs
(AD-A125711; NRL-MR-5035) Avail: NTIS HC A02/MF A01 CSCL 11/6

New design concepts are being developed for deep ocean offshore platforms in depth exceeding 1,000 feet. One such design is the tension leg platform (TLP). The designs contemplate the use of tension members connecting the floating platform to anchors embedded in the sea floor. High strength steel is the material of choice for the tension legs in order to minimize weight and provide adequate buoyancy. However, the use of high strength steel members under tension loads in seawater raises serious questions concerning long term structural integrity owing to the possibility of environmental cracking. A summary of the technological assessment of environmental cracking of high strength steels in seawater is provided. Factors considered in assuring the adequacy of the proposed design concepts are delineated. Author

N83-28211# Systems Research Labs., Inc., Dayton, Ohio. Research Applications Div.
ACCELERATED CORROSION TESTING Final Report, 1 Jun. 1979 - 31 May 1982
M. Khobaib Wright-Patterson AFB, Ohio AFWAL Sep. 1982 148 p refs
(Contract F33615-79-C-5109; AF Proj. 2418)

(AD-A125639; SRL-6507; AFWAL-TR-82-4186) Avail: NTIS HC A07/MF A01 CSCL 11/6

Available methods for accelerated testing of corrosion behavior yield results which are not sufficiently accurate or reliable for predicting the service life of aircraft components and materials which degrade or fail due to environmental attack. Research has been conducted in controlled atmospheres on the localized environmental enhancement of crack-growth rates of aerospace alloys in order to provide the basis for development of realistic accelerated corrosion tests. Slow-strain-rate, corrosion-fatigue, and rising-load experiments have been conducted on high-strength 4340 steel and 7075-T6 aluminum alloy using accelerating pollutants such as sulfur dioxide, nitrogen dioxide, surface salt, and ambient to 100%-relative-humidity (RH) air in a specially designed atmospheric chamber. Author (GRA)

N83-28212# Columbia Univ., New York. School of Mines.
THE EFFECTS OF SMALL DEFORMATION ON CREEP AND STRESS RUPTURE OF ODS SUPERALLOYS Final Technical Report, 1 Jun. 1978 - 30 Sep. 1982
Vincent C. Nardone, Daniel E. Matejczyk, and John K. Tien 7 Jan. 1983 58 p refs
(Grant AF-AFOSR-3637-78; AF Proj. 2306)
(AD-A125640; AFOSR-83-0095TR) Avail: NTIS HC A04/MF A01 CSCL 11/6

This Air Force sponsored research program studied the effects of predeformation including periodic load cycling on the creep and stress rupture of oxide dispersion strengthened (ODS) high temperature alloys. The alloys most studied in this program are inconel MA 754, a Ni-Cr alloy strengthened by oxide dispersoids, and MA 6000, strengthened by both the oxide dispersoids and gamma prime precipitates. At temperatures above 1093 degrees C, these alloys have better creep resistance than any current high temperature alloy. The MA 754 alloy is now used as stator components in the hot sections of jet engines and MA 6000 is the only candidates turbine blade ODS alloy. Author (GRA)

N83-28213# Case Western Reserve Univ., Cleveland, Ohio. Inst. of Technology.
IMPROVING THE HIGH TEMPERATURE CREEP AND RUPTURE RESISTANCE OF OXIDE-DISPERSION-STRENGTHENED ALLOYS Final Report, Sep. 1980 - 31 Mar. 1982
L. J. Ebert, M. L. Telich, M. D. Holly, and T. Wassel Warren, Mich. Army Tank Automotive Command 30 Apr. 1982 89 p
(Contract DAAB07-80-C-9091)
(AD-A125656; TACOM-TR-12662) Avail: NTIS HC A05/MF A01 CSCL 11/6

The deformation annealing response of the ODS (Oxide-Dispersion-Strengthened) alloy MA 754 was examined in the effort to develop a thermomechanical technique whereby the alloy can be brought to near finish shaped components while at the same time improving the high temperature performance characteristics of the material. Major emphasis placed on (1) characterization of the as-received material in order to establish base - line properties, and (2) the evaluation of various thermomechanical processing schedules combining cold working (by rolling) and annealing in order to attain the most favorable grain morphology. The as-received alloy was found to be very amenable to cold rolling; initial experiments produced reductions on the order of 70%. Subsequent strain energy relaxation treatments however, were unsuccessful in stabilizing the improved grain morphology produced by cold rolling. Utilization of a revised cold rolling plus anneal schedule (one involving step-wise cold working and annealing was found to permit reductions on the order of at least 40% while still maintaining a stable large grained structure. GRA

N83-28214# Mound Lab., Miamisburg, Ohio.
METALLOGRAPHY OF MICROWELDS BY MICROTOMING
J. J. Cramer, J. Turner, and C. S. Gustin 1982 13 p refs Presented at the 15th Ann. Intern. Metallographic Soc. Meeting, Orlando, Fla., 18 Jul. 1982
(Contract DE-AC04-76DP-00053)
(DE82-019173; MLM-2985(OP); CONF-820724-3) Avail: NTIS HC A02/MF A01

A diamond-bladed microtome similar to the type used for slotting of production parts was adapted for metallography of laser welds of one mil wire. Sample preparation and analysis of the welds can be completed in approximately 15 to 20 min as opposed to the minimum of 3 hr required by the standard metallographic technique of mounting, grinding, and polishing. Surfaces of the metals produced by microtoming prior to etching are superior and have less deformed metal than surfaces produced by the standard metallographic techniques. DOE

N83-28215# Pacific Northwest Lab., Richland, Wash.
FATE OF CORROSION PRODUCTS RELEASED FROM STAINLESS STEEL IN MARINE SEDIMENTS AND SEAWATER. PART 4: HATTERAS ABYSSAL RED CLAY
R. L. Schmidt Jul. 1982 31 p refs
(Contract DE-AC06-76RL-01830)
(DE82-019842; PNL-3446-Pt-4) Avail: NTIS HC A03/MF A01

A study in which neutron activated 347 stainless steel was exposed to surficial sediment from a site in the Hatteras Abyssal Plain of the Northwest Atlantic Ocean is described. This sediment consists of approximately 20% CaCO3, which could lead to the formation of calcareous scale on the metal surface and reduce the corrosion rate. The distribution of indigenous metals among different chemical fractions shows that extractable Cr, Mn, Fe, Co, and Zn were associated with amorphous Mn and Fe oxides. Most of the remaining extractable Cr, and about a third of the extractable Cu appear to have been weakly complexed. Major fractions (25 to 36%) of extractable Mn, Co and Ni were present as adsorbed cations. Organic complexation appears to account for a large amount of extractable Fe, Ni, Cu and Zn. Neutron activated 347 stainless steel specimens were exposed to sediment slurry under aerobic and non-oxygenated conditions for a period of 94 days. DOE

N83-28216# Pacific Northwest Lab., Richland, Wash.
FATE OF CORROSION PRODUCTS RELEASED FROM STAINLESS STEEL IN MARINE SEDIMENTS AND SEAWATER. PART 1: NORTHEAST PACIFIC PELAGIC RED CLAY
R. L. Schmidt Mar. 1982 45 p refs
(Contract DE-AC06-76RL-01830)
(DE82-012251; PNL-3466-Pt-1) Avail: NTIS HC A03/MF A01

To provide information useful for determining the biogeochemical cycling of corrosion products in the benthic boundary layer of the deep ocean, neutron activated stainless steel was exposed to seawater and to Northeast Pacific red clay under aerobic and non-oxygenated conditions. The trace metal geochemistry of the sediment and the chemical specification of the corrosion products is described. The sediments generally consisted of reddish brown clay at the surface grading to a dark brown transition zone below which mottled olive-gray clay prevailed. Neutron irradiated 347 stainless steel specimens were exposed to seawater and sediment slurry under aerobic and non-oxygenated conditions for 108 days. The presence of aerated sediment more than doubled the amount of corrosion products released compared to aerated seawater and non-oxygenated sediment treatments. DOE

N83-28217# California Univ., Livermore. Lawrence Livermore Lab.
EXAMINATION AND SENSITIVITY STUDY OF THE KOVEC CONSTITUTIVE MODEL FOR BERYLLIUM
W. C. Moss and L. A. Glenn Jan. 1983 36 p refs
(Contract W-7405-eng-48)
(DE83-006505; UCID-19596) Avail: NTIS HC A03/MF A01

The consistency of the KOVEC constitutive model for beryllium was checked with experimental data, by examining work hardening, the temperature dependence of the yield strength, strain-rate effects, and the Hugoniot (U/sub s/-U/sub p/) relations. The sensitivity of simulations of uniaxial strain plate impact experiments, in which beryllium was used, to changes in the beryllium constitutive model was examined. The nonuniqueness of constitutive models was discussed. DOE

N83-28218# Bendix Corp., Kansas City, Mo.
FRACTURE MECHANICS OF TITANIUM ALLOYS Final Report
M. G. Ulitchny Jun. 1982 10 p refs
(Contract DE-AC04-76DP-00613)
(DE82-016354; BDX-613-2793) Avail: NTIS HC A02/MF A01

Since the inception of fracture toughness testing of high strength materials at Bendix, a wide range of titanium materials has been studied. Initial studies were carried out on beta extruded Ti6Al-6V-2Sn. Later studies were conducted on both Ti-6Al-6V-2Sn and Ti-6Al-4V procured as prealloyed and blended elemental powder metal parts and on castings of these same alloys. Results of all technical studies have been reported previously and are summarized. DOE

N83-28219# Edgerton, Germeshausen and Grier, Inc., Idaho Falls, Idaho.
FAILURE OBSERVATIONS OF PRESSURIZED TUBES OF CANDIDATE ALLOYS IN 9900 C COAL-GASIFICATION ATMOSPHERES
G. R. Smolik Feb. 1983 44 p refs
(Contract DE-AC07-76ID-01570)
(DE83-009191; EGG-FM-6187) Avail: NTIS HC A03/MF A01

Causes for failures in pressurized tubes of alloys in high temperature simulated coal gasification atmospheres (CGAs) were investigated. The influences of cyclic loading was studied. Throttling valves were used in a 6.89 MPa test system to vary the magnitude of cyclic loads. A limited number of scoping tests were performed to determine lifetimes, defined as time for perforation. Metallography was also performed to identify reactant products and damage associated with corrosion and cracking present in tube specimens. Reductions of lifetime in air for two alloys, Incoloy 800 H and Haynes 188 are indicated. Severe corrosion occurred in three alloys exposed in simulated CGAs. This severe corrosion and inadequate control of cyclic loading variables prevents a quantitative assessment of relative influences of biaxial stress and cyclic loading upon enhanced corrosion. DOE

N83-28220# Massachusetts Inst. of Tech., Cambridge. Dept. of Mechanical Engineering.
MICROMECHANICAL MODELING OF MICROSTRUCTURAL DAMAGE IN CREEPING ALLOYS Progress Report, 1 Mar. 1982 - 28 Feb. 1983
A. S. Argon and F. A. McClintock 1 Mar. 1983 54 p refs
(Contract DE-AC02-77ER-04461)
(DE83-009248; DOE/ER-04461/3) Avail: NTIS HC A04/MF A01

Microstructural damage in creeping alloys was studied. Intergranular cavitation, and crack growth and macrofracture were investigated. DOE

N83-28221# Westinghouse Hanford Co., Richland, Wash.
CREEP AND SWELLING OF TYPE 348 STAINLESS STEEL AT TEMPERATURES UP TO 700 K AND COMPARISON WITH FAST REACTOR DATA
J. M. Beeston (EG and G, Idaho Inc.) and L. E. Thomas 1982 32 p refs Presented at the 11th Intern. Symp. on Effects of Radiation on Mater., ASTM, Scottsdale, Ariz., 28-30 Jun. 1982
(Contract DE-AC07-76ID-01570)
(DE82-018844; EGG-M-06382; CONF-820628-13) Avail: NTIS HC A03/MF A01

In-reactor creep and swelling of Type 248 stainless steel from ATR SN-5 and ETR H-10 in-pile tube measurements were investigated to identify and characterize their mechanistic relationships at temperatures less than 723 K. The principal creep mechanism appears to be diffusion along high conductivity paths related to interstitial loops. The irradiation creep is a function of temperature and is presented as an empirical equation. The swelling in the ATR in-pile tubes is also presented as an empirical equation. DOE

N83-28222# SRI International Corp., Menlo Park, Calif.
COMPACTION OF AMORPHOUS FERROMAGNETIC METAL POWDERS Final Report
R. D. Caligiuri Jun. 1982 31 p refs
(EPRI Proj. 7876-13)
(DE82-905767; EPRI-EL-2449) Avail: NTIS HC A03/MF A01

The attractive magnetic properties of certain amorphous metal powders might be exploited in the electrical industry if the powders can be consolidated into relatively dense compacts. The production of integral bodies of an amorphous powder was attempted using explosive compaction techniques. A disk-shaped compact 2.5 cm in diameter by 1 cm thick having a relative measured density of 91% was produced in a simple double-shock experiment. No degradation in magnetic properties was apparent. Application of additional explosive pulses and other explosive techniques are expected to increase the density and improve magnetic properties. DOE

N83-28223# Hanford Engineering Development Lab., Richland, Wash.
SWELLING IN NEUTRON-IRRADIATED TITANIUM ALLOYS
D. T. Peterson Apr. 1982 30 p refs Presented at the 11th Intern. Symp. on Effects of Radiation on Mater., ASTM, Scottsdale, Ariz., 28-30 Jun. 1982
(Contract DE-AC06-76FF-02170)
(DE82-017776; HEDL-SA-2564-FP; CONF-820628-8) Avail: NTIS HC A03/MF A01

Immersion density measurements were performed on a series of titanium alloys irradiated in EBR-2 to a fluence of 5 x 10 to the 22nd power n/sq cm (e > 0.1 MeV) at 450 C and 550 C. The materials irradiated were the near-alpha alloys Ti-624S and Ti-5621S, the alpha-beta alloy Ti-64, and the beta alloy Ti-38644. Swelling was observed in all alloys with the greater swelling being observed at 550 C. Microstructural examination revealed the presence of voids in all alloys. Ti-38644 was found to be the most radiation resistant. Ti-6242S and Ti-5621S also displayed good radiation resistance, whereas considerable swelling and precipitation were observed in Ti-64 at 550 C. DOE

N83-28224# Los Alamos Scientific Lab., N. Mex.
MECHANICAL PROPERTIES OF 800-MeV PROTON-IRRADIATED METALS
R. D. Brown and J. R. Cost 1982 17 p refs Presented at the 11th Intern. Symp. on Effects of Radiation on Mater., ASTM, Scottsdale, Ariz., 28-30 Jun. 1982
(Contract W-7405-eng-36)
(DE82-011985; LA-UR-82-672; CONF-820628-1) Avail: NTIS HC A02/MF A01

Accelerator beam line components and spallation neutron targets operate in an irradiation environment where changes in mechanical properties can adversely effect component integrity. The effects of low fluenes of 800-MeV protons on the yield strength, tensile strength, and ductility of samples of 304 stainless steel, Alloy 718, molybdenum, and tantalum were studied. Tensile samples (0.75 or 1.6 mm thick) were directly water cooled during irradiation and were tested at room temperature. For the 304 stainless steel and annealed Alloy 718, the yield strengths incresed by about a factor of 3 and 16 respectively, while the ductility decreased approximately 30 and 40 percent. In the bcc metals (tantalum and molybdenum), the yield strengths increased by at least a factor of 2. Tantalum samples retained significant ductility at room temperature, while several molybdenum specimens broke at less than 0.2 percent strain. These irradiation-induced changes at low proton fluences should not impair the usefulness of these materials (other than molybdenum) in accelerator environments. DOE

N83-28225# California Univ., Berkeley. Lawrence Berkeley Lab. Materials and Molecular Research Div.
TEM CHARACTERIZATION OF Mo SUB 2 C PRECIPITATES IN MOLYBDENUM M.S. Thesis
Jean-Marc Lang Apr. 1982 35 p refs
(Contract W-7405-eng-48)
(DE82-014988; LBL-14295) Avail: NTIS HC A03/MF A01

Semicoherent platelets of hcp Mo2C in a bcc Mo matrix were analysed. The habit plane was found to be the [301] Mo planes; the precipitate broad faces are covered by one set of dislocations

lying along [anti 113] Mo direction; this direction is the calculated line which remains invariant in the transformation from the bcc to the hcp lattice. The Orientation Relationship is close to the Burgers orientation relationship with an additional rotation bringing (101)(Mo) and (anti 1011) Mo2C into coincidence. Due to this rotation two variants are in twin relation and it was found that these two variants grew together. DOE

N83-28226# Oak Ridge National Lab., Tenn. Metals and Ceramics Div.
OPTICAL AND ELECTRON MICROSCOPY OF WC-Co ALLOYS
C. S. Yust and E. L. Long, Jr. Feb. 1982 26 p refs
(Contract W-7405-eng-26)
(DE82-007789; ORNL/TM-8139) Avail: NTIS HC A03/MF A01

The microstructures of three commercial cobalt-bonded tungsten carbide alloys were characterized by optical and electron microscopy and compared with a specially formulated reference alloy composed of tungsten carbide bonded by 6 wt % Co. The first alloy contained additions of chromium as chromium carbides, was similar in microstructure to the reference alloy, and contained secondary carbide grains retained from the chromium addition. An alloy containing metallic chromium also contained grains of the ternary carbide Co3W3C, or eta phase, which can be rationalized as having formed by reaction of the molten cobalt-chromium binder phase with the tungsten carbide matrix at the processing temperature. The third commercial alloy examined contained a coarse dendritic structure identified as a mixture of eta (Co3W3C) and chi (Co3W9C4) phases. The reactions responsible for formation of the eta and chi phases in this alloy were not determined. DOE

N83-28227# Knolls Atomic Power Lab., Schenectady, N. Y.
IMPROVED CHARACTERIZATION OF AQUEOUS CORROSION KINETICS OF ZIRCALOY-4
H. R.. Peters Jun. 1982 20 p refs Presented at 6th Intern. Conf. on Zirconium in the Nucl. Indus., Vancouver, British Columbia, 28 Jun. 1982
(Contract DE-AC12-76SN-00052)
(DE82-018781; KAPL-4153; CONF-820662-3) Avail: NTIS HC A02/MF A01

In the analysis of the posttransition corrosion regime of zircaloys in a water environment it was assumed that the cycles occurring after the first cycle (pretransition) could be approximated by a constant rate. Long term testing of Zircaloy-4 has shown this assumption to be nonconservative. Posttransition rates are seen to increase with increasing weight gain or time until a steady state posttransition rate is achieved. The corrosion of Zircaloy-4 in a water environment is, therefore, seen to have a transitory regime in addition to the pretransition and steady state posttransition regimes. The mathematical description of this transition regime is presented. DOE

N83-28228# California Univ., Berkeley. Lawrence Berkeley Lab. Materials and Molecular Research Div.
SODIUM SULFATE INDUCED CORROSION OF ALLOYS AT INTERMEDIATE TEMPERATURES Ph.D. Thesis
Ajaya K. Misra Apr. 1982 188 p refs
(Contract DE-AC03-76SF-00098)
(DE82-018804; LBL-14591) Avail: NTIS HC A09/MF A01

The Na2SO4 induced corrosion of alloys at temperatures that correspond to the low power operation of gas turbines (650 to 850 C) is studied. Studies were made to understand the effect of sulfurous gases plus NaSO4 deposits, Na2SO4-NaCl deposits and HCl(g) in the atmosphere on the corrosion behavior of nickel base alloy containing Cr, Al, and Co. DOE

N83-28229# Oak Ridge National Lab., Tenn. Metals and Ceramics Div.
ION DAMAGE IN 316 STAINLESS STEEL OVER A BROAD DOSE RANGE
N. H. Packan and K. Farrell 1982 20 p refs Presented at the 11th Intern. Symp. on Effects of Radiation on Mater., Am. Soc. for Testing and Mater., Scottsdale, Ariz., 28 Jun. 1982
(Contract W-7405-eng-26)
(DE82-017370; CONF-820628-4) Avail: NTIS HC A02/MF A01

Microstructural evolution was examined in annealed 316 stainless steel after heavy-ion bombardment in the range 1 to 256 dpa at 900 K with simultaneously implanted helium at a rate of 10 appm/dpa and deuterium at a rate of 25 appm/dpa. Phase decomposition was rather limited compared with that in neutron irradiations; only an unidentified plate-like precipitate at low dose, and blocky M23C6 particles on grain boundaries were formed. Swelling from cavity formation increased with dose to about 20% at about 170 dpa above which it appeared to saturate. Cavity concentrations saturated at about 100 dpa, and dislocations much earlier. The matrix cavities included a persistent complement of aproximately 7 nm diam small cavities. Similar-size helium bubbles were prolific on the grain boundaries. DOE

N83-28230# Hanford Engineering Development Lab., Richland, Wash.
RELATIONSHIP BETWEEN PHASE DEVELOPMENT AND SWELLING OF AISI 316 DURING TEMPERATURE CHANGES
W. J. S. Yang and F. A. Garner Apr. 1982 20 p refs Presented at the 11th Intern. Symp. on Effects of Radiation on Mater., 28-30 Jun. 1982, Scottsdale, Ariz.
(Contract DE-AC06-76FF-02170)
(DE82-017737; HEDL-SA-2576-FP; CONF-820628-12) Avail: NTIS HC A02/MF A01

The effect of temperature changes on radiation-induced swelling and phase development of AISI 316 has been examined for specimens irradiated in two different experiments. The formation of radiation-stable phases at low temperature appears to precede swelling but these phases tend to dissolve when subsequently subjected to higher temperature. Phases which develop at high temperature persist when the temperature is subsequently lowered. Once nucleated at low temperatures, voids tend to persist without reduction in density at higher temperatures. However, a new round of void nucleation occurs when the temperature is decreased during irradiation. If the swelling has entered the steady-state swelling regime prior to the temperature change, there is no effect on the subsequent swelling rate. For temperature changes that occur before the end of the transient swelling regime, substantial changes can occur in the swelling behavior, particularly if the changes occur in the range around 500 deg. DOE

N83-28231# Mound Lab., Miamisburg, Ohio.
SURFACE CHANGE IN TITANIUM BETWEEN 25 AND 1000 DEG C STUDIED BY AUGER ELECTRON SPECTROSCOPY AND X-RAY PHOTOELECTRON SPECTROSCOPY
Pu Sen Wang, William E. Moddenman, Louis W. Collins, and Tom N. Wittberg 18 Jun. 1982 8 p refs
(Contract DE-AC04-76DP-00053)
(DE82-017352; MLM-2945) Avail: NTIS HC A02/MF A01

The dissolution of native oxides on titanium were studied over the temperature range 25 to 1000 C to determine their role in the pyrotechnic reaction of titanium with potassium perchlorate. From Auger electron spectroscopy (AES) data it was found that the solubility of the oxide in Ti increased sharply at 350 C. High resolution AES scans of the Ti LMM transitions as well as X-ray photoelectron spectroscopy (XPS) scans of the Ti 2p level showed that free Ti is present at the surface above 350 C. The O ls XPS data show that the surface contains hydroxyl as well as oxide groups. The hydroxide-to-oxide ratio begins to decrease below 250 C, and at 450 C the remaining oxygen is found predominantly as oxide. In addition, the XPS data show that the dissolution process proceeds through the formation of titanium suboxides. These AES and XPS results complement physical property measurements that have also been made on the Ti/KClO4 mixture. DOE

N83-28232# Hanford Engineering Development Lab., Richland, Wash.
INFLUENCE OF COLD-WORK LEVEL, SOLUTE, AND HELIUM CONTENT ON THE SWELLING OF PURE AISI 316 (Fe-17Cr-16.7Ni-2.5Mo)
H. R. Brager and F. A. Garner Apr. 1982 15 p refs Presented

at the 11th Intern. Symp. on Effects of Radiation on Mater., ASTM, Scottsdale, Ariz., 28 Jun. 1982
(Contract DE-AC06-76FF-02170)
(DE82-018924; HEDL-SA-2618-FP; CONF-820628-15) Avail: NTIS HC A02/MF A01

A quaternary alloy representing AISI 316 without solutes was irradiated at 350 C, 550 C, and 650 C in each of the following conditions: annealed, 20 percent cold worked, annealed plus helium implanted, 20 percent cold worked plus helium implanted and various annealed or cold work plus implanted and aged conditions. The implanted specimens contained a range of helium concentrations injected at ambient temperatures. All specimens chosen for examination by electron microscopy and immersion density were irradiated at 3 to 5 dpa. In agreement with an earlier microchemically-based prediction, it was found that both the volume and density of voids were insensitive to cold work in an alloy lacking minor solutes such as silicon and carbon. DOE

N83-28233# Oak Ridge National Lab., Tenn.
LOW-ALLOY STEELS FOR THICK-WALLED PRESSURE VESSELS Summary Progress Report, 1 Feb. 1980 - 31 Jan. 1982
J. A. Todd, D. W. Chung, and E. R. Parker 1982 105 p refs
(Contract W-7405-eng-26)
(DE82-018324; DOE/NBM-2018324) Avail: NTIS HC A06/MF A01

The effects of Mn, Ni and Cr on the creep rupture and hydrogen attack susceptibilities of Cr-Mo steels were studied. Hydrogen attack studies were also carried out on A533B and model alloy systems to investigate the role of alloy carbides in promoting resistance to hydrogen damage. Creep rupture fracture times were determined at 500, 560 and 600 C for periods up to 2000 hours. The effects of cooling rate from the austenitizing temperature and tempering response on the microstructure of 3Cr-1Mo-1Mn-1Ni steel were studied. The carbide structures in all the alloy modifications were carefully characterized. Data were collected from preliminary weld bead-on-plate tests of A387 and temper embrittlement studies of A543 with mischmetal addition. The mechanical property, elevated temperature creep and hydrogen attack data suggests that addition of 0.75 Cr + 0.5 Mn + 1Ni is beneficial in reducing susceptibility to hydrogen damage but is detrimental to creep rupture properties. DOE

N83-28234# Northwestern Univ., Evanston, Ill. Dept. of Materials Science and Engineering.
INVESTIGATION OF MICROSTRUCTURAL CHANGES IN FERRITIC STAINLESS STEELS CAUSED BY HIGH TEMPERATURE DEFORMATION Technical Progress Report, 15 Sep. 1981 - 1 Jul. 1982
J. R. Weertman Jul. 1982 9 p refs
(Contract DE-AC02-81ER-10960)
(DE82-018794; DOE/ER-10960/1) Avail: NTIS HC A02/MF A01

Small angle neutron scattering of changes in the microstructure of modified 9Cr1Mo steel produced by prolonged aging was studied as well as grain boundary damage in steel caused by room temperature deformation. DOE

N83-28235# Illinois Univ., Urbana. Dept. of Physics.
INTERSTITIAL-IMPURITY INTERACTIONS IN COPPER-SILVER AND ALUMINUM-MAGNESIUM ALLOYS Ph.D. Thesis
Humphrey Pan Wong 1982 175 p refs
(Contract DE-AC02-76ER-01198)
(DE82-015207; DOE/ER-01198/1382) Avail: NTIS HC A08/MF A01

The configurations and dynamical properties of complexes formed between interstitials and oversized impurities in electron irradiated aluminum and copper were determined. The ultrasonic attenuation and resonant frequency in single crystal samples of Cu-Ag and Al-Mg were measured. A variety of peaks appeared in both materials in plots of the logarithmic decrement versus temperature. The simultaneous presence of multiple defects was established by the different annealing behavior shown by each peak. It was found that interstitial trapping in oversized systems was generally weaker than in previously studied undersized systems. The principal features that must be accounted for by a model of each crystal are examined and two models are developed. DOE

N83-28236# Argonne National Lab., Ill. Materials Science and Technology Div.
COMPOSITIONAL CHANGES IN Fe-Cr-Ni ALLOYS UNDER PROTON BOMBARDMENT AT ELEVATED TEMPERATURES
N. Q. Lam Oct. 1982 26 p refs Presented at the Symp. on Radiation Damage Anal. for Fusion Reactors, St. Louis, 25-28 Oct. 1982 Submitted for publication
(Contract W-31-109-eng-38)
(DE83-007763; CONF-821049-16) Avail: NTIS HC A03/MF A01

Compositional redistribution in austenitic Fe-Cr-Ni alloys during energetic proton bombarement was calculated as a function of time, temperature, and ion energy, using a kinetic model of radiation induced segretation recently developed for ternary alloys. The effect of spatial nonuniformity in damage rates was taken into account and found to have a peculiar effect on the redistribution of the alloying elements. Enrichment of Ni occurs at the bombarded surface and in the bulk beyond the damage range, whereas Fe and Cr are enriched in the peak damage region at the expense of their depletion in regions near the surface and beyond the damage range. These compositional changes can lead to local phase transformation, since the composition of local regions of the alloy is shifted away from the initial composition into different parts of the multicomponent phase diagram. The stability of the austenite phase in the subsurface and post range regions is enhanced by irradiation, while the austenite to ferrite transformation takes place in the peak damage region. DOE

N83-28237# Massachusetts Inst. of Tech., Cambridge. Dept. of Ocean Engineering.
STUDY OF RESIDUAL STRESSES AND DISTORTION IN STRUCTURAL WELDMENTS IN HIGH-STRENGTH STEELS Final Report, 1 Dec. 1977 - 31 May 1982
John E. Agapakis, Vassilios J. Papazoglou, Akihiko Imakita, and Koichi Masubuchi 30 Nov. 1982 108 p refs
(Contract N00014-75-C-0469)
(AD-A125746) Avail: NTIS HC A06/MF A01 CSCL 11/6

Work performed on the initial tasks of the project (study of residual stresses and distortion in thick plates, cylindrical shells and bronze weldments is summarized. Results on the final tasks are detailed. The developed analytical models for the calculation of residual stress relaxation during stress-relief heat treatments are presented. The model predictions are compared with experimental results obtained with edge welded HY-130 and 304 stainless steel plates. Finally, computer programs and manuals developed during this study are presented. GRA

N83-28238# Technische Hogeschool, Delft (Netherlands). Group for Materials Science.
STRESS CORROSION BEHAVIOUR OF PRESTRESSING STEEL IN A SLOW STRAIN RATE TEST IN A CONCENTRATED SOLUTION OF AMMONIUM THIOCYANATE
G. deWind and C. vanDam Sep. 1982 14 p refs
(PB83-145193; STEVIN-1-82-12) Avail: NTIS HC A02/MF A01 CSCL 11F

The stress corrosion behavior of two prestressing steels of the cold drawn type (R sub m 1800 N/sq mm) has been determined in a slow strain rate test in a solution of 20% ammonium thiocyanate at room temperature. Both fractured brittle at a rate of 0.000001/s and at gauge lengths of 8 cm and longer. GRA

N83-28239# Environmental Sciences Research Lab., Research Triangle Park, N.C. Technical Planning and Review Office.
ECONOMIC ASSESSMENT OF POLLUTION RELATED CORROSION DAMAGE
Fred H. Haynie 1982 16 p refs
(PB83-148148; EPA-600/D-82-363) Avail: NTIS HC A02/MF A01 CSCL 11F

The importance of corrosion as a product life limiting factor will increase with the necessity to conserve limited resources.

Thus, an economic model to assess pollution related corrosion costs becomes a useful decision tool. Physical damage, geographic distribution, maintenance, replacement, substitution, and value lost due to decreased utility or appearances are incorporated into this model. These interrelated factors are subject to individual decisions, which can be assumed in calculating best, worst, and most likely cases for different pollution levels. GRA

N83-28593# Battelle Columbus Labs., Ohio.
HYDROGEN EMBRITTLEMENT OF STEEL PIPELINES
John H. Holbrook, H. J. Cialone, and M. E. Mayfield *In* Courtesy Assoc., Inc. Proc. of the DOE Phys. and Chem. Storage Ann. Contractors' Rev. Meeting Dec. 1982 p 42-47 (For primary document see N83-28586 17-44)
Avail: NTIS HC A25/MF A01

27 NONMETALLIC MATERIALS

Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials.

N83-28240* National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
ELASTOMER TOUGHENED POLYIMIDE ADHESIVES Patent
Anne K. St.Clair and Terry L. St.Clair, inventors (to NASA) Issued 21 Jun. 1983 6 p Filed 2 Oct. 1981 Supersedes N82-25384 (20 - 16, p 2221)
(NASA-Case-LAR-12775-1; US-Patent-4,389,504; US-Patent-Appl-SN-308201; US-Patent-Class-524-233; US-Patent-Class-524-726; US-Patent-Class-524-104; US-Patent-Class-524-173; US-Patent-Class-525-181; US-Patent-Class-525-183; US-Patent-Class-525-184; US-Patent-Class-525-474) Avail: US Patent and Trademark Office CSCL 11C

A rubber-toughened addition-type polyimide composition is disclosed which has excellent high temperature bonding characteristics in the fully cured state, and improved peel strength and adhesive fracture resistance physical property characteristics. The process for making the improved adhesive involves preparing the rubber containing amic acid prepolymer by chemically reacting an amine-terminated elastomer and an aromatic diamine with an aromatic dianhydride with which a reactive chain stopper anhydride was mixed, and utilizing solvent or mixture of solvents for the reaction. Official Gazette of the U.S. Patent and Trademark

N83-28241 Florida Univ., Gainesville.
PLASTICITY OF CERAMIC PARTICULATE SYSTEMS Ph.D. Thesis
Mark Alan Janney 1982 168 p
Avail: Univ. Microfilms Order No. DA8226399

The purpose of this dissertation was two-fold. The first was to study the mechanical behavior of alumina powder compacts saturated with liquid and compare this behavior with that for wet clay. The second was to determine whether the soil mechanics approach to particulate plasticity could be successfully applied to ceramic particulate systems. Standard soil mechanics test procedures were employed to determine pressure-volume relationships, response to combined states of isotropic and shear stress, and unconfined shear strength. In addition, some experiments were conducted in a piston extruder to study the role of pore fluid pressure in extrusion. The experimental study showed that the mechanical behavior of wet alumina was quite similar to that for wet clay. In consolidation, specific volume was proportional to in (applied stress). Critical state soil mechanics was used to analyze and interpret the data. Dissert. Abstr.

N83-28242# Utah Univ., Salt Lake City. Dept. of Materials Science and Engineering.
EFFECTS ON PROCESSING CONDITIONS ON THE RELIABILITY OF CROSS-LINKED POLYETHYLENE-CABLE INSULATION Progress Report
Paul J. Phillips 1983 13 p refs
(Contract DE-AC02-79ER-10421)
(DE83-008986; DOE/ER-10421/4) Avail: NTIS HC A02/MF A01

Three different methods for processing of cross linked polyethylene cable insulation were studied. The crystallization process in cross linked polyethylene, the effect of processing conditions on the morphology of miniature extruded cables and the effects of morphological and processing variables on dielectric loss and dielectric breakdown were investigated. Investigations concentrated on the first of the three areas. Research in the second and third areas is now underway and dielectric loss effects, being now complete. These three areas are reviewed separately. DOE

N83-28243*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
WEAR PARTICLE ANALYSIS USING THE FERROGRAPH
William R. Jones, Jr. 1983 23 p refs Presented at the Joint Meeting of the Fluid Power Soc. and the Am. Soc. of Lubrication Engr., Detroit, 26 Apr. 1983
(NASA-TM-83422; E-1648; NAS 1.15:83422) Avail: NTIS HC A02/MF A01 CSCL 11H

The use of the Ferrograph in analyzing wear particles from a variety of different sources is reported. Examples of wear particles from gas turbine engines, bearing tests, friction and wear tests, hydraulic systems, and human joints are illustrated. In addition, the separation of bacteria and human cells is described. Author

N83-28244# Army Armament Research and Development Command, Watervliet, N. Y. Large Caliber Weapon Systems Lab.
EFFECTS OF CURING TEMPERATURE AND TIME ON CORROSION RESISTANCE, WEAR LIFE, ADHESION AND COMPLETENESS OF CURE OF SANDSTROM SOLID FILM LUBRICANT NUMBER 9A Final Report
David Trevett Jan. 1983 30 p
(AD-A125098; ARLCB-MR-83002) Avail: NTIS HC A03/MF A01 CSCL 11/8

The effect of curing temperature and time on a heat cured solid film lubricant (SFL) were investigated using accelerated corrosion and wear tests. Surface preparation and quality control inspections were also checked. Air cured SFL's were evaluated for corrosion resistance and wear life. A compromise between corrosion resistance and wear life must be made when selecting curing temperature and time for heat cured SFL. Air cured SFL's showed very poor corrosion resistance and wear life. Author (GRA)

N83-28245# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio.
SYNTHESIS AND PROPERTIES OF MODEL AROMATIC POLYIMIDE SYSTEMS Final Report, Jan. - Oct. 1980
B. A. Reinhardt and F. E. Arnold Aug. 1982 26 p refs
(AD-A125734; AFWAL-TR-82-4038) Avail: NTIS HC A03/MF A01 CSCL 11/9

In an effort to investigate the hydrolytic stability of completely aromatic polymides a series of model polymeric imide structures have been synthesized. The materials consist of oligomeric thermoset systems and high molecular polymers. Equivalent backbone structures were synthesized differing only in respect to the size of the imide ring. It is anticipated that the utilization of the model systems prepared will establish the hydrolytic stability of aromatic polyimides. Author (GRA)

N83-28246# Honeywell Corporate Research Center, Bloomington, Minn.
STUDY OF MECHANO-CHEMICAL MACHINING OF CERAMICS AND THE EFFECT ON THIN FILM BEHAVIOR Final Technical Report, 1 May 1980 - 30 Nov. 1982
H. Vora and R. J. Stokes Jan. 1983 40 p refs
(Contract N00014-80-C-0437)
(AD-A125342) Avail: NTIS HC A03/MF A01 CSCL 11/4

Efforts have been made in this program to develop mechano-chemical polishing technique for a number of materials and to

determine the consequences of mechanochemically polished surfaces on the physical performance of ceramics. The objective of the mechanochemical polishing efforts is to produce scratch-and-damage-free surfaces by finding suitable soft abrasives that remove material from the workpiece through chemical reactions. Mechanochemical polishing effects were observed when hotpressed and reaction bonded Si3N4 were polished with two oxides of iron, Fe2O3 and Fe3O4. Mechanochemically polished surfaces of Si3N4 were analyzed using the techniques of Auger electro spectroscopy, profilometry and interferometry. Data showing the effects of mechanochemical polishing on the strength of hot-pressed Si3N4 and on the adhesion of thin titanium films on this material have been obtained. Also preliminary efforts have been made ot find suitable soft abrasives for mechanochemical polishing of GaAs, Spinel (MgO.Al2O3) Sic, B4C, and partially stabilized Zro2.
Author (GRA)

N83-28247# Wright State Univ., Dayton, Ohio. Dept. of Chemistry.
SYNTHESIS AND EVALUATION OF NEW INTRAMOLECULAR CURE INTERMEDIATES Final Technical Report, 1 Apr. - 30 Sep. 1982
William A. Feld Sep. 1982 18 p refs
(Grant AF-AFOSR-0140-82; AF Proj. 2303)
(AD-A125674; AFOSR-83-0108TR) Avail: NTIS HC A02/MF A01 CSCL 13/8

The objectives of this research were the synthesis of 1,4,4,7-tetraphenyl-hepta-1,6-diyne-3,5-dione, ne-1,5-diyne,3-amino-2-(m-aminophenylethynyl)-N-phenylbenzamid e and 4-amino-2-(m-aminophenylethynyl)-N-phenylbenzamide and their evaluation as potential intramolecular cure (IMC) agents. The reaction of diphenylmalonyl dichloride with phenylacetylene in the presence of bis(triphenylphosphine)palladium(II) similarly substituted malonyl dichlorides with cuprous phenylacetylide yields only diphenylbutadiyne. The reaction of phenylethynylmagnesium bromide with substituted malonaldehydes followed by oxidation of the resulting diol to a diketone represents a better synthetic method if the malonaldehydes are available. GRA

N83-28248*# National Materials Advisory Board, Washington, D.C. Committee on Thermal Spray Coatings for Corrosion Control.
METALLIZED COATINGS FOR CORROSION CONTROL OF NAVAL SHIP STRUCTURES AND COMPONENTS Final Report
Feb. 1983 115 p refs Sponsored in part by NASA
(Contract MDA903-82-C-0434)
(NASA-CR-170363; NAS 1.26:170363; AD-A125600; NMAB-409) Avail: NTIS HC A06/MF A01 CSCL 11C

In attempting to improve corrosion control, the U.S. Navy has undertaken a program of coating corrosion-susceptible shipboard components with thermally sprayed aluminum. In this report the program is reviewed in depth, including examination of processes, process controls, the nature and properties of the coatings, nondestructive examination, and possible hazards to personnel. The performance of alternative metallic coating materials is also discussed. It is concluded that thermally sprayed aluminum can provide effective long-term protection against corrosion, thereby obviating the need for chipping of rust and repainting by ship personnel. Such coatings are providing excellent protection to below-deck components such as steam valves, but improvements are needed to realize the full potential of coatings for above-deck service. Several recommendations are made regarding processes, materials, and research and development aimed at upgrading further the performance of these coatings. GRA

N83-28249# Westinghouse Electric Corp., Lester, Pa.
FIRE-RETARDANT LUBRICANT FOR TURBINE GENERATORS Final Report
J. Pankowiecki Jan. 1983 130 p refs
(EPRI Proj. 1843-1)
(DE83-901476; EPRI-NP-2843) Avail: NTIS HC A07/MF A01

The use of a fire resistant fluid in steam turbine generator lubrication systems would reduce the fire risks associated with current mineral lubricating oils. The feasibility of modifying an existing Westinghouse lubrication system to use a phosphate ester lubricating fluid was determined. The effects of the fluid on major components of the lubrication system including oil supply system, bearings, and generator hydrogen seal system were investigated. Performance and material compatibility impact on system components are identified and modifications recommended where required. Estimates of major modification costs are presented. With appropriate system modifications, a phosphate ester fluid is an effective and reliable steam turbine generator lubricant. Recommendations are presented for component verification testing. DOE

N83-28250# Southwest Research Inst., San Antonio, Tex.
LABORATORY EVALUATION OF POLYURETHANE FOAM FOR GEOTHERMAL LOST-CIRCULATION PLUGGING
Emil Tschoepe, III, B. C. Caskey, ed., and J. R. Kelsey, ed. Apr. 1982 40 p
(Contract DE-AC04-76DP-00789)
(DE82-015516; SAND-81-7227) Avail: NTIS HC A03/MF A01

To evaluate polyurethane foam formulations for use in plugging hot (such as geothermal) formations when lost circulation is encountered during drilling, laboratory tests of three foams were performed. Foams were mixed at high temperature (up to 300 F) and high pressure (up to 900 psig); the mechanical and fluid loss properties of the foams were subsequently determined. The results show that polyurethane foams can be mixed at downhole conditions and yield acceptable plugging properties. DOE

N83-28251# Army Materials and Mechanics Research Center, Watertown, Mass.
IMPLEMENTING AGREEMENT FOR A PROGRAM OF RESEARCH AND DEVELOPMENT ON HIGH TEMPERATURE MATERIALS FOR AUTOMOTIVE ENGINES. ANNEX 1: CERAMICS FOR AUTOMOTIVE GAS TURBINE ENGINES Report, Apr. 1981 - Mar. 1982
Dec. 1982 24 p
(Contract DE-AI01-77CS-51017)
(DE83-006212; DOE/CS-51017-1) Avail: NTIS HC A02/MF A01

Several Consulting Committee meetings have been conducted since the last annual report of activities. These included a session on 11 March 1981, held in conjunction with the International Gas Turbine Conference in Houston, TX and a gathering on 27 October 1981, which coincided with the US Department of Energy Contractors Coordination Meeting at Dearborn, Michigan. These various conferences permitted in-depth technical discussions. Regarding information exchange, thus far more than 52 reports have been provided from West German participants to their US counterparts. In response to this data, all available reports from current major United States automotive engine and ceramic component development efforts being conducted by the US DOE have been provided to West Germany. Two types of structural ceramics have been exchanged and subjected to destructive and non-destructive testing. Results from five hundred specimens are currently being evaluated. As far as scientist exchange visits, engineers from the DFVLR, IzfP and Daimler-Benz have visited AMMRC as well as numerous US contractor facilities. Further efforts have been devoted to development of life prediction methodology and both experimental and analytical progress has been made. Calculations of rotor hub transient thermal response have been compared by Ford and Diamler-Benz engineers. In conclusion, during the past year, significant International Energy Agency Implementing Agreement. DOE

N83-28252# Booz-Allen and Hamilton, Inc., Bethesda, Md.
ENHANCED UTILIZATION OF USED LUBRICATING OIL RECYCLING PROCESS BY-PRODUCTS Final Report
K. D. Weinstein, T. D. Myers, and S. R. Craft (Chromaspec Corp.) Mar. 1982 165 p refs
(Contract DE-AC19-79BC-10059)
(DE82-007671; DOE/BC-10059/19) Avail: NTIS HC A08/MF A01

Possible utilization options for the process by-products generated in the re-refining of used lubrication oils were studied. By-product samples from six re-refineries utilizing four re-refining

processes were taken. Detailed physical and chemical characterization data on the sample streams and their components were compiled by means of comprehensive laboratory testing. Given the characteristics of the various streams and pertinent regulations that impact possible uses, options for utilization of the by-product streams were derived. The apparently feasible options were subjected to several levels of engineering feasibility testing to determine technical viability. Apparently viable options were found for all by-product streams, and where data existed, economic analyses were performed. Many of the economic analyses indicate either significant plant savings or increased plant revenues as a result of the implementation of the options. DOE

N83-28253# Airco Temesal, Berkeley, Calif. Metallurgical Products Div.
CERAMIC THERMAL-BARRIER COATING BY ELECTRON-BEAM PHYSICAL VAPOR DEPOSITION: MICROSTRUCTURAL DEPENDENCE ON THE TEMPERATURE OF FORMATION Final Report, 1 Jun. - 31 Aug. 1981
J. Guitron and R. E. Demaray 18 Jun. 1982 22 p refs
(Contracts DE-AC03-79ET-12292; ET-78-C-03-2156)
(DE82-017772; DOE/ET-12292/T2) Avail: NTIS HC A02/MF A01

The temperature of formation of a ceramic thermal barrier coating (TBC) is controlled in vacuo by internal substrate impingement cooling using both compressed air and water. Major changes in TBC columnar morphology are achieved and controlled in this fashion. Implications for potential thermal cycle durability are discussed. DOE

N83-28254# Didier-Werke A.G., Wiesbaden (West Germany).
PRODUCTION AND REFINEMENT OF REFRACTORY CERAMIC FIBER MATERIAL FOR USE IN REACTION CHAMBERS WITH MECHANICAL, THERMAL AND CHEMICAL LOAD Final Report, Dec. 1980
Rudolf Ganz and Axel Eschner Bonn Bundesministerium fuer Forschung und Technologie Feb. 1983 53 p In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-83-019; ISSN-0340-7608) Avail: NTIS HC A04/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 11

An insulating material with inorganic bonding for high temperature applications, based on ceramic fiber from the binary system Al2O3-SiO2 was developed. It has significantly lower shrinkage than conventional fiber materials with organic bonding, higher strength even at high temperatures, low loss on ignition, high resistance to acids and abrasion. It has lower density, lower thermal conductivity, better resistance to acids and higher spalling resistance than insulating firebricks. The high binder content, the fragility and the moderate spalling resistance are disadvantages of the new material. Author (ESA)

28 PROPELLANTS AND FUELS

Includes rocket propellants, igniters, and oxidizers; storage and handling; and aircraft fuels.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power,* and *44 Energy Production and Conversion.*

N83-28255*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
RESEARCH ON AVIATION FUEL INSTABILITY
Charles E. Baker, David A. Bittker, Stephen M. Cohen, and Gary T. Seng 1983 20 p refs Proposed for presentation at the AGARD Propulsion and Energetics Panel Symp. on Combust. Probl. in Turbine Eng., Cesme, Turkey, 3-7 Oct. 1983
(NASA-TM-83420; E-1710; NAS 1.15:83420) Avail: NTIS HC A02/MF A01 CSCL 21D

The underlying causes of fuel thermal degradation are discussed. Topics covered include: nature of fuel instability and its temperature dependence, methods of measuring the instability, chemical mechanisms involved in deposit formation, and instrumental methods for characterizing fuel deposits. Finally, some preliminary thoughts on design approaches for minimizing the effects of lowered thermal stability are briefly discussed. Author

N83-28256*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
TEST PROGRAM TO DEMONSTRATE THE STABILITY OF HYDRAZINE IN PROPELLANT TANKS
Clifford M. Moran and Roy A. Bjorklund Apr. 1983 100 p refs (Contract NAS7-100)
(NASA-CR-172768; JPL-Pub-83-37; NAS 1.26:172768) Avail: NTIS HC A06/MF A01 CSCL 21I

A 24-month coupon test program to evaluate the decomposition of propellant tanks is reported. The propellant fuel evaluated was monopropellant-grade hydrazine (N2H4), which is normally a colorless, fuming, corrosive, strongly reducing liquid. The degree of hydrazine decomposition was determined by means of chemical analyses of the liquid and evolved gases at the end of the test program. The experimental rates of hydrazine decomposition were determined to be within acceptable limits. The propellant tank materials and material combinations were not degraded by a 2-year exposure to hydrazine propellant. This was verified using change-of-weight determinations and microscopic examination of the specimen surface before and after exposure, and by posttest chemical analyses of hydrazine liquid for residual metal content. Author

N83-28257# Naval Research Lab., Washington, D. C. Combustion and Fuels Branch.
FUEL SEDIMENT ANALYSIS BY FSCA Interim Report
Margaret Wechter and Robert N. Hazlett 25 Feb. 1983 15 p refs
(ZF65571005)
(AD-A125718; NRL-8673) Avail: NTIS HC A02/MF A01 CSCL 07/4

The technique of x-ray photoelectron spectroscopy (XPS, ESCA) was applied to the analysis of sediments which are formed in fuel and which degrade fuel storage stability. Samples studied included sediments formed in a Navy Paraho Shale II DFM fuel by doping fuel samples with 2,5-dimethylpyrrole and stressing the mixtures for periods of 4 to 28 days at 80 C. Several naturally occurring sediments were also investigated. Carbon, oxygen, nitrogen, and sulfur spectra were obtained where applicable. Atomic ratio results show indications of changes in sediment composition over time, and indicate that the composition of various fractions associated with a given sediment may differ. Comparisons of the ESCA spectra of induced vs natural sediments indicated some differences particularly in the nitrogen spectra. Some solubility studies were performed to determine effects of stress time on solubility. The sediment fractions remaining after solvent treatment were also subjected to analysis by ESCA. A comparison of their spectra with the sediment spectra taken before solvent treatment indicated differences in the atom ratios. Structural feature comparisons were inconclusive. GRA

N83-28258# Los Alamos Scientific Lab., N. Mex.
INVESTIGATION OF THE PHYSICAL AND EXPLOSIVES PROPERTIES OF THE EUTECTIC EXPLOSIVE AMMONIUM NITRATE/AMMONIUM 3,5-DINITRO-1,2,4-TRIAZOLATE Annual Report, 1978
M. M. Stinecipher Jun. 1982 14 p refs
(Contract W-7405-eng-36)
(DE82-019499; LA-9267) Avail: NTIS HC A02/MF A01

Consolidification of an explosive salt, ammonium 3,5-dinitro-1,2,4-triazolate (ADNT), with an oxidizer, ammonium nitrate (AN), by cooling from the entectic melt produced a mixture that detonated ideally. The melt was also a good matrix for slurrying other explosives or aluminum. The addition of aluminum to a mixture with excess AN improved the performance. Although temperature cycling of cylindrical charges caused 11 vol % expansion, the charges retained their integrity. The preparation of ADNT and the

procedure used to mix AN/ADNT is explained. The explosive sensitivity was determined and performance of AN/ADNT mixtures and their mixtures with other explosives, and particle size and shape was studied by scanning electron microscopy. DOE

N83-28259# Los Alamos Scientific Lab., N. Mex.
THERMOCHEMICAL EVALUATION OF ZERO-ORDER PROCESSES INVOLVING EXPLOSIVES
R. N. Rogers and J. L. Janney 1982 7 p refs Presented at 7th Intern. Conf. on Thermal Analysis, Kingston, Ontario, 22 Aug. 1982
(Contract W-7405-eng-36)
(DE82-012150; LA-UR-82-886; CONF-820809-2) Avail: NTIS HC A02/MF A01

Methods for identifying zero order reactions between metals and chemical explosives and for predicting their hazard potential are reported. It is concluded that quantitative predictive models can be made for the thermal hazards of explosives systems involving zero order reactions. The zero order reactions can be identified by making order plots of isothermal DSC rate data. Kinetics constants can be measured for the zero order reactions of complex processes (if homogeneous mixtures can be produced), and critical temperatures can be predicted. Predictions can be tested against experimental values. Incompatibilities between explosives and materials that provide hazardous zero order contributions to the self heating process can easily be detected with a time to explosion test. However, because increasing amounts of catalyst will increase the dilution as well as increasing catalyst surface area, tests at different compositions are required for greatest confidence. Predictions of hazards for sizes and shapes other than those tested require a kinetics-based predictive model. DOE

N83-28260# California Univ., Livermore. Lawrence Livermore Lab.
SYNTHESIS OF DENSE ENERGETIC MATERIALS Annual Report
C. Coon Jul. 1982 42 p refs
(Contract W-7405-eng-48)
(DE82-019105; UCID-19441) Avail: NTIS HC A03/MF A01

Following strict guidelines pertaining to energy, density, and stability, specific target molecules were chosen that appear to possess the improved properties desired for energetic materials. Topics covered include: (1) polymers of pentanitrobenzene; (2) nitro-1,2,4-oxadiazoles; (3) RDX-HMX homologs; (4) di-RDX; (5) bicyclo-HMX; (6) adamantane structures; and (7) miscellaneous reactions. DOE

N83-28261# Chem Systems, Inc., New York.
PARAMETRIC ANALYSIS SUPPORT FOR ALCOHOL-FUELS PROCESS DEVELOPMENT Final Report, 1 Jan. - 30 Jun. 1981
Feb. 1983 169 p refs
(Contracts DE-AC02-77CH-00178; EG-77-C-01-4042)
(DE83-008130; SERI/STR-231-1744) Avail: NTIS HC A08/MF A01

Parametric analyses of an alcohol fuels plant producing 50 million gal/y of ethanol by the high temperature dilute acid hydrolysis of aspen wood or corn stover are decribed. Analyses were carried out by computer simulation. The simulation performs material and energy balances, estimates capital and operating costs, and calculates the selling price of ethanol. Pretreatments and delignification are justified only if the value of lignin is greater than $0.40/lb. Sensitivity analyses determine the effect of hydrolysis conditions on yield and selling price. It is found that sugar concentration prior to fermentation is justified. DOE

N83-28262# Department of Energy, Grand Forks, N. Dak.
A SURVEY OF SYNFUEL TECHNOLOGY FOR LIGNITE Final Report
Everett A. Sondreal 1982 18 p refs Presented at the Alabama Lignite Conf., Birmingham, Ala., 20-21 Jul. 1982
(DE83-006573; DOE/FC-1008; CONF-820769-1) Avail: NTIS HC A02/MF A01

The most important market for lignite will continue to be the electric utility industry, where it is used to fuel large pc-fired boilers serving major regional power grids. However, the growth of this market and technology is being challenged by new and more stringent environmental control requirements, including the international concern over acid rain. Environmental and economic issues could either encourage or limit the development of a synfuels market for lignite depending on the cost effectiveness of the technological solutions that are developed. Clearly the United States needs to develop its coal resources to reduce dependence on imported oil. However, demand for coal derived substitute petroleum is constrained by cost for the forseeable future. Government policy initiatives and new technology are the keys to removing these constraints in the decades ahead. A crossover point with respect to petroleum and natural gas is reached at some point in the future, which allows synthetic fuels to penetrate the markets now served by oil and gas. DOE

N83-28263# Sandia Labs., Albuquerque, N. Mex.
COMPATIBILITY OF HEADER MATERIALS WITH PYROTECHNIC POWDER
L. J. Weirick Dec. 1982 23 p refs
(Contract DE-AC04-76DP-00789)
(DE83-006586; SAND-81-2018) Avail: NTIS HC A02/MF A01

Several stainless steels, nickel-base alloys and a titanium alloy are qualified as candidates for explosive component applications. The compatibility of these materials with pyrotechnic powder is analyzed. The powder is a combined titanium subhydride-potassium perchlorate mixture, used both wet and dry. Hollow tensile bars were utilized to discern interactions between the metal and powder which underwent accelerated aging. Metallography was employed along with the mechanical property results to characterize the extent of interaction. No degradation in mechanical properties was noted. DOE

N83-28264# California Univ., Berkeley. Lawrence Berkeley Lab. Energy and Environment Div.
LIQUID FUELS BY DIRECT LIQUEFACTION OF BIOMASS
Hubert G. Davis, Carlos Figueroa, and Larry L. Schaleger Mar. 1982 25 p refs Presented at 5th KTI Ann. High Temp. Processing Technol. Symp., Napa Valley, Calif., 9-12 May 1982
(Contracts DE-AC02-76SF-00098; DE-AC06-76RL-01830)
(DE82-013011; LBL-14155; CONF-820535-1) Avail: NTIS HC A02/MF A01

Conversion of Douglas fir wood chips to a crude fuel oil, under an atmosphere of carbon monoxide, hydrogen and steam was accomplished by at least two processes. An oil-wood-flour slurry (oil recycle) process was achieved at the cost of extremely high recycle ratio of product oil (about 19/1) and of effluent water. A single pass, water-slurry process is currently operating a bench-scale continuous liquefaction unit. The feedstock was an aqueous slurry of prehydrolyzed Douglas fir wood chips. Yields of oil product are higher than was estimated from the Albany experience but are consistently lower than achieved by the recycle process. The difference is real, and is caused by a greater formation of water-soluble products such as carboxylic acids in the water-slurry process. No significant difference in either oil yield or product analysis was found when the CO-H2 reactant gas mixture is replaced by either CO or H2 alone. DOE

N83-28265# Battelle Pacific Northwest Labs., Richland, Wash.
BIOMASS LIQUEFACTION-PRODUCT ANALYSIS AND UPGRADING
Douglas C. Elliott 1982 17 p refs Presented at the Meeting of the Canadian Biomass Liquefaction Researchers, Saskatoon, Saskatchewan, 16-17 Feb. 1982
(Contract DE-AC06-76RL-01830)
(DE82-012851; PNL-SA-10235; CONF-820232-2) Avail: NTIS HC A02/MF A01

An overview of the analytical and process research underway in biomass liquefaction is presented. Product analyses were performed on the products produced at the Biomass Liquefaction

Test Facility. Both analytical data and technique description are presented. Process research results on upgrading of the liquefaction product through catalytic hydrogenation are also included. These results include data from wood oil component testing. DOE

N83-28266# California Univ., Livermore. Lawrence Livermore Lab.
HIGH-FREQUENCY ELECTROMAGNETIC PROBING AT LLNL'S LARGE-BLOCK COAL GASIFICATION
K. I. Kishiyama 6 Apr. 1982 15 p refs
(Contract W-7405-eng-48)
(DE82-013761; UCID-19356) Avail: NTIS HC A02/MF A01

LLNL is conducting a series of large block coal gasification experiments to further investigate burn-cavity and product-gas phenomenon as a function of various input parameters. These experiments are located on a hillside where the Big Dirty coal seam outcrops near Centralia, Washington. HFEM probing was deployed there between January 4 and January 13, 1982 to help determine the characteristics of the burn-cavity. The main feature of these large block tests is that, after the completed burn, the block could be excavated to map the actual cavity. This will provide an opportunity to compare and verify our data and the accuracy and resolution of the system. Since the burn area was small and the boreholes closely spaced, there was less signal attenuation than in previous experiments. Thus, higher frequencies were used for better resolution. Also, sufficient data was taken to use image reconstruction algorithms to produce a tomograph of the burn-cavity. DOE

N83-28267# California Univ., Livermore. Lawrence Livermore Lab.
CONCEPTUAL DESIGN STUDY FY 1981: SYNFUELS FROM FUSION, USING THE TANDEM MIRROR REACTOR AND A THERMOCHEMICAL CYCLE TO PRODUCE HYDROGEN
Oscar H. Krikorian, ed., Richard L. Werner, Terry R. Galloway, Gary L. Johnson, Myron A. Hoffman (California Univ., Davis), Fred L. Ribe (Washington Univ., Seattle), Gene L. Woodruff (Washington Univ., Seattle), Shiva Sitaraman (Washington Univ., Seattle), T. H. Zerguini (Washington Univ., Seattle), Don S. Rowe (Rowe and Associates, Bellevue, Wash.) et al 9 Feb. 1982 347 p refs
(Contracts W-7405-eng-48; DE-AM06-76RL-02225; DE-AT06-76ET-52047)
(DE82-013790; UCID-19311) Avail: NTIS HC A15/MF A01

A scoping and conceptual design study being conducted for the express purpose of evaluating the engineering potential of producing hydrogen by thermochemical cycles, using a tandem mirror fusion driver is represented. The hydrogen thus produced is then used as a feedstock to produce fuels such as methane, methanol, or gasoline. The main objective was to obtain some approximate cost figures for hydrogen production through a conceptual design study. DOE

N83-28268# Massachusetts Inst. of Tech., Cambridge. Dept. of Chemical Engineering.
CROSSED REACTION NETWORKS IN THE CATALYTIC HYDRONITROGENATION OF SYNTHETIC LIQUID FUELS Quarterly Report, 1 Feb. - 30 Apr. 1982
Charles N. Satterfield and Shan Hsi 1982 24 p refs
(Contract DE-AC22-80PC-30075)
(DE82-013796; DOE/PC-30075/9) Avail: NTIS HC A02/MF A01

Progress reports are presented for the following studies: effect of hydrogen sulfide on quinoline hydrodenitrogenation; (HDN) effect of hydrogen donor liquid on quinoline HDN; and effect of oxygenated compounds on quinoline HDN. The highlights are: (1) The results of detailed modeling of data obtained in the presence of H2S were completed and are compared to studies in the absence of H2S. Some hypotheses are advanced about the nature of the catalytically-active sites in the presence of H2S. (2) Some problems with reactor plugging with a BzTHQ feed in the presence of CS2 are believed to be caused by the formation of an imine as an intermediate that can readily form an imine trimer. (3) Studies with tetraline in the carrier liquid showed that it does not act as a hydrogen donor but instead inhibits the HDN reaction. Preliminary scouting studies with oxygenated compounds in the feed were made. DOE

N83-28269# Department of Energy, Washington, D. C. Assistant Secretary for Fossil Energy.
ALTERNATIVE FUELS PRODUCTION PROGRAM. REPORT TO THE CONGRESS OF THE UNITED STATES Semiannual Report
Jun. 1982 28 p
(DE82-019401; DOE/FE-0023; Rept-5) Avail: NTIS HC A03/MF A01

This report describes: (1) the provisions of Public Law 96-126 and subsequent legislation enacted by Congress applicable to this program; (2) program accomplishments, reports on the status of the feasibility studies, cooperative agreements, and the Great Plains Gasification Project loan guarantee. Program accomplishments are summarized by types of alternative fuel. DOE

N83-28270# McGill Univ., Montreal (Quebec).
HYDROGEN-AIR DETONATIONS
C. M. Guirao, R. Knystautas, J. H. Lee, W. Benedick, and M. Berman 1982 17 p refs Presented at the 19th Intern. Symp. on Combustion, Haifa, Israel, 8 Aug. 1982 Prepared in cooperation with Sandia National Labs.
(Contract DE-AC04-76DP-00789)
(DE82-018649; SAND-82-1494C; CONF-820801-11) Avail: NTIS HC A02/MF A01

The Three Mile Island nuclear plant accident has triggered renewed interest in fundamental combustion studies in hydrogen-air mixture. The present study is concerned with the problem of detonation of atmospheric, hydrogen-air mixtures and reports new experimental results on cell sizes lamba and critical tube diameters d/sub c/. The results confirm the empirical correlation d/sub c/ = 13 lamba. Comparison of the critical tube diameter of stoichiometric hydrogen-air mixtures (d/sub c/ = 20 cm) with that of stoichiometric acetylene-air mixtures (d/sub c/ = 12 cm) indicates that hydrogen is slightly less sensitive than acetylene. The relatively slow increase in d/sub c/ for H2-rich mixtures (as compared to lean mixtures) indicates that fuel-rich mixtures are more hazardous from the detonation point of view than fuel-lean mixtures. Regarding the detonability limits, the present paper formally defines limit criteria for different boundary conditions based on the cell size of the mixture. For fully confined detonations in tubes, limits are set by the onset of single-headed spin. DOE

N83-28271# Los Alamos Scientific Lab., N. Mex.
COAL-POWDER CHARACTERIZATION AND THERMAL ANALYSIS
G. Bennett and M. Luther 1982 54 p refs Presented at Scanning Electron Microscopy Ann. Meeting, Anaheim, Calif., Apr. 1982
(Contract W-7405-eng-36)
(DE82-006146; LA-UR-81-3788; CONF-820409-1) Avail: NTIS HC A04/MF A01

A continuous (CW) CO2 laser was used to pyrolyze crushed coal samples in a helium atmosphere. The unsieved coal was characterized to define an average particle diameter and the distribution of diameters. This statistical information is used in several finite element numerical models to predict the temperatures and heating rates that occur in the sample and in individual particles during an experiment. The calculation of the peak temperature reached on the sample surface correlates well with experimental measurements. The numerical model predicts the correct shape of the temperature fields but does not account for differences observed in the amount of coal undergoing pyrolysis as a function of average particle diameter. Scanning electron microscopic (SEM) examination of coal samples after laser pyrolysis indicates that the powder cannot be accurately modeled as a single-phase continuum, but must be considered on a smaller, or particle level scale. DOE

N83-28272# Brookhaven National Lab., Upton, N. Y.
ANODE DEPOLARIZERS IN ELECTROLYTIC HYDROGEN PRODUCTION

M. Beller Jun. 1982 16 p refs
(Contract DE-AC02-76CH-00016)
(DE82-018316; BNL-51562) Avail: NTIS HC A02/MF A01

Brookhaven National Laboratory manages an extensive program in the areas of hydrogen and energy storage potentials. As part of an ongoing portfolio analysis of projects, the prospects for applications for anode depolarizers are presented. The system requirements are outlined, and economic criteria are developed. It is concluded that moderate incentives exist for successful development. Research and Development priorities are formulated. DOE

N83-28273# Teledyne CAE, Toledo, Ohio. Turbine Engines.
GAS TURBINE DEMONSTRATION OF PYROLYSIS: DERIVED FUELS Technical Progress Report, 1 Jul. 1979 - 31 Dec. 1981
G. Jasas and J. Kasper 1982 42 p refs
(Contract DE-AC03-78ET-13333)
(DE82-007193; DOE/ET-13333/T1; TPR-3) Avail: NTIS HC A03/MF A01

The objective of this program is to demonstrate the feasibility of utilizing pyrolytic oil and char as a fuel for a combustion turbine engine. This is the first phase of an extended program with the ultimate goal of commercializing a gas turbine engine and electrical generating system which is independent of petroleum-based fuels. Maximum use of existing technology and current production engine hardware is being incorporated for a sequence of test evaluations rating from isolated combustor component tests to full scale engine demonstration tests. The technical goals to be achieved during the course of this project are: pyrolytic fuel characterization in terms of its properties and constituents; pyrolytic fuel combustion technology in gas turbine application in terms of pyrolytic oil atomization, quantity of char burned, emissions, performance and associated combustion system aerothermodynamics; pyrolytic fuel (oil and char slurry) handling, mixing, and storage technology; and engine materials compatibility with the pyrolytic fuel and its combustion products. DOE

N83-28274# Brookhaven National Lab., Upton, N. Y. Dept. of Energy and Environment.
STATUS OF ADVANCED ELECTROLYTIC HYDROGEN PRODUCTION IN THE UNITED STATES AND ABROAD
M. Bonner, T. Botts, J. McBreen, A. Mezzina, F. Salzano, and C. Y. Yang 1982 13 p refs Presented at the World Hydrogen Energy Conf., Pasadena, Calif., 13-17 Jun. 1982
(Contract DE-AC02-76CH-00016)
(DE82-009927; BNL-30987; CONF-820605-14) Avail: NTIS HC A02/MF A01

For the past five years the Department of Energy has sponsored a program aimed at the development of advanced technology for the electrolytic production of hydrogen. The original goal was to create a large-scale hydrogen production capability in the United States which would be based upon nonfossil energy resources and would be suitable for commercialization by industry as markets would be realized. Brookhaven National Laboratory (BNL) was assigned technical responsibility for a program which addresses hardware development at three industrial contractors as well as supporting fundamental research at BNL and several university laboratories. Recently, revised federal guidelines and budgetary reductions have resulted in a reversal of priorities which favor longer range research activities and which virtually eliminate the support of large-scale development engineering and test projects. Programs at BNL were redirected reflecting these revised guidelines and emphazing longer-term research activities. DOE

N83-28275# Brookhaven National Lab., Upton, N. Y. Dept. of Energy and Environment.
COAL-OIL MIXTURES. AN ALTERNATIVE FUEL FOR THE COMMERCIAL SECTOR Annual Report, fiscal year 1981
T. Butcher, C. R. Krishna, and J. Saunders Aug. 1982 77 p refs
(Contract DE-AC02-76CH-00016)
(DE83-008472; BNL-551596) Avail: NTIS HC A05/MF A01

Results are presented from a program aimed at identifying the hardware systems required for the implementation of coal-oil mixtures (COM) as a substitute boiler fuel in the commercial sector. Components for a COM burner system were evaluated both in a cold burner system test stand and a small cast iron boiler fitted with a modified retention head burner. Control valves, pumps, atomizers, and strainers were selected and combustion trials were conducted. Results are presented on thermal efficiency and particulate emissions. Agitation of a commercial sector fuel storage tank with a slurry recirculation system was evaluated through model tank tests. The most successful arrangement tested was a set of six nozzles aimed across the tank floor. A fully settled slurry in the model tank was resuspended in three hours and maintained at 98% suspension. Tests were also conducted in a 3800 liter (1000 gallon) vertical tank with a propeller agitator where it was shown that the slurry is easily resuspended. An evaluation of the economics of conversion to COM in the commercial sector is presented. DOE

N83-28276# Brookhaven National Lab., Upton, N. Y.
SOLIDIFICATION OF OILS AND ORGANIC LIQUIDS
D. E. Clark, P. Colombo, and R. M. Neilson, Jr. Jul. 1982 31 p refs
(Contract DE-AC02-76CH-00016)
(DE83-008474; BNL-51612) Avail: NTIS HC A03/MF A01

The suitability of selected solidification media for application in the disposal of low level oil and other organic liquid wastes was investigated. Evolving regulations regarding the disposal of these materials encourage soldification. Solidification media which were studied include Portland type 1 cement; vermiculite plus Portland type 1 cement; Nuclear Technology Corporation's Nutek 380-cement process; emulsifier, Portland type 1 cement sodium silicate; Delaware Custom Material's cement process; and the US Gypsum Company's Envirostone process. Waste forms were evaluated for their ability to reliably produce free standing monolithic solids which are homogeneous (macroscopically), contain < 1% free standing liquids by volume and pass a water immersion test. Solidified waste form specimens were subjected to vibratory shock testing and flame testing. Simulated oil wastes can be solidified to acceptable solid specimens having volumetric waste loadings of less than 40 volume-%. Simulated organic liquid wastes, however, could not be solidified into acceptable waste forms above a volumetric loading factor of about 10 volume-% using the solidification agents studied. DOE

N83-28277# Tri-State Synfuels Co., Houston, Tex.
TRI-STATE SYNFUELS PROJECT REVIEW. VOLUME 6: ENVIRONMENTAL, HEALTH, SAFETY AND SOCIOECONOMIC REVIEW
Jun. 1982 702 p refs
(Contract DE-FC05-8104-20807)
(DE83-007539; DOE/OR-20807-T1-Vol-6) Avail: NTIS HC A99/MF A01

Volume 6 includes: site selection (National screening: Powder River Basin, San Juan Basin, Illinois Basin, East Texas lignite belt, and North Dakota-Montana lignite belt; regional screening - 12 sites in Kentucky); environmental and socio-economic factors; land use; solid waste management; beneath and safety management; regulatory review; permit applications; meteorology; local government; transportation facilities, etc. Some of the surveys were quite detailed. DOE

N83-28278# Technische Hogeschool, Delft (Netherlands). Dept. of Aerospace Engineering.
LOW PRESSURE COMBUSTION CHARACTERISTICS OF COMPOSITE PROPELLANT
H. F. R. Schoeyer and P. A. O. G. Korting Dec. 1982 88 p refs Prepared in cooperation with Prins Maurits Lab. TNO
(VTH-LR-367; PML-1982-165) Avail: NTIS HC A05/MF A01

A technique for the simultaneous determination of burning rate, combustion efficiency, and oscillatory combustion sensitivity of a propellant which can burn at subatmospheric pressures was developed. Experiments show that the propellant burns at pressures as low as 0,005 MPa (absolute). Combustion efficiency is

poor at these pressures. From 0,005 MPa up to 1 MPa a good burning rate correlation is established. The de Vieille law applies at subatmospheric pressures; a change in the burning rate exponent occurs at 0,1 MPa. A second batch of propellant manufactured at a different time, but with the same composition has a completely different burning rate relationship. Oscillatory combustion is observed. Frequencies range from 10 to 70 Hz for the first propellant and center around 25 Hz for the second. The real part of the response function varies between 1 and 3,5 for both batches. Author (ESA)

N83-28594# Brookhaven National Lab., Upton, N. Y.
A TEST BED FOR ADVANCED HYDROGEN TECHNOLOGY PHOTOVOLTAIC ARRAY/ELECTROLYZER SYSTEM
Gerald Strickland *In* Courtesy Assoc., Inc. Proc. of the DOE Phys. and Chem. Storage Ann. Contractors' Rev. Meeting Dec. 1982 p 48-52 ref (For primary document see N83-28586 17-44)
Avail: NTIS HC A25/MF A01

N83-28596# Brookhaven National Lab., Upton, N. Y.
ADVANCED CONCEPTS FOR ELECTROLYTIC HYDROGEN PRODUCTION
James McBreen and C. Y. Yang *In* Courtesy Assoc., Inc. Proc. of the DOE Phys. and Chem. Storage Ann. Contractors' Rev. Meeting Dec. 1982 p 57-66 refs (For primary document see N83-28586 17-44)
Avail: NTIS HC A25/MF A01

N83-28597# Life Systems, Inc., Cleveland, Ohio.
STATIC FEED WATER ELECTROLYSIS FOR LARGE SCALE HYDROGEN GENERATION
Franz H. Schubert, Andy J. Kovach, and Kenneth A. Burke *In* Courtesy Assoc., Inc. Proc. of the DOE Phys. and Chem. Storage Ann. Contractors' Rev. Meeting Dec. 1982 p 67-73 refs (For primary document see N83-28586 17-44)
Avail: NTIS HC A25/MF A01

31 ENGINEERING (GENERAL)

Includes vacuum technology; control engineering; display engineering; and cryogenics.

N83-28279# British Library Lending Div., Boston Spa (England).
DESCRIBING THE SHAPE OF A FORGING AND FORMING A GRID FOR CALCULATING DIE-FORGING PROCESSES
Yu. N. Reznikov and G. M. Korochkin 14 Apr. 1983 5 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Chernaya Met. (USSR), v. 4, 1982 p 70-72
Avail: British Library Lending Div., Boston Spa, Engl.

The examined method of describing the cross-section shapes of billets via the coordinates of points on the cross-section contours sharply reduces the time spent on coding the starting data for calculating die forging processes by the method of finite elements. Basing construction of the grid of finite elements for calculating die forging processes on a free Lagrange description of motion proves to be desirable. For problems of calculation of the shapes and dimensions of billets for die forging the grid is built on contour nodes formed by points in the cross-sections. Author

N83-28280# British Library Lending Div., Boston Spa (England).
COORDINATION OF EQUIPMENT MAINTENANCE IN OXYGEN-CONVERTER SHOPS
I. G. Stepanov, N. A. Efimov, and K. E. Kapustin 14 Apr. 1983 10 p Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Chernaya Met. (USSR), v. 4, 1982 p 149-153
(BLL-M-26976-(5828.4)) Avail: British Library Lending Div., Boston Spa, Engl.

A procedure is proposed for coordinating maintenance of converters and ancillary equipment in oxygen-converter shops. This can be an effective means of raising the level of utilization of production facilities. The procedure takes account of the available maintenance-services capacity within the shop and of services brought in from outside. The considerable benefits from maintenance coordination are illustrated by an example worked for a converter shop. Author

N83-28281*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
ELEVATED WATERPROOF ACCESS FLOOR SYSTEM AND METHOD OF MAKING THE SAME Patent Application
Marc M. Cohen, inventor (to NASA) Filed 1 Jun. 1983 15 p
(NASA-Case-ARC-11363-1; US-Patent-Appl-SN-500046) Avail: NTIS HC A02/MF A01 CSCL 13B

An elevated waterproof access floor system having subfloor channels or compartments for power lines, gas lines or the like is adapted such that it can be opened and subsequently resealed without destroying the waterproofing and without destroying its aesthetic appearance. A multiplicity of tiles are supported on a support grid, and a flooring sheet is supported on the tiles. Attachment means are provided to prevent lateral but not vertical movement of the flooring sheet with respect to the tiles so that the flooring sheet can be lifted off the tiles, but when the flooring sheet is supported on the tiles, no lateral slipping will occur. The flooring sheet is made of a heat resealable material, so that it can be cut away in sections, and the tiles therebelow lifted off, to provide access to subfloor compartments. NASA

N83-28282# United States Metric Board, Arlington, Va.
PERSPECTIVES ON FUTURE METRIC CONVERSION. THE VIEW OF PRINCIPAL METRIC CONVERSION PLANNING AND COORDINATING ORGANIZATIONS
1982 43 p Presented at the Final Meeting of the United States Metric Board, Jul. 1982
Avail: NTIS HC A03/MF A01

A summary report by the U.S. Metric Board consisted two area-findings and recommendations. Among the findings, the following areas were covered: metric conversion on an individual company level, the cost analysis, consumer response, the dual system, and legal barriers. Among the recommendations of interest are the following: continued enforcement of the metric conversion act, public awareness, consumer, and education programs should continue, and enactment of a uniform metric conversion legislation. B.G.

N83-28283# Federal Aviation Administration, Washington, D.C.
ADVISORY CIRCULAR. BUILDING FOR STORAGE AND MAINTENANCE OF AIRPORT SNOW REMOVAL AND ICE CONTROL EQUIPMENT: A GUIDE
25 Mar. 1983 26 p
(FAA-AC-150/5220-15) Avail: NTIS HC A03/MF A01

Standards are suggested for an airport maintenance, storage, and snow removal equipment building that can protect the airport's investment in snow and ice control equipment, as well as in stored ice conrol materials, as well as support safe all-weather aircraft operations. It is advantageous to size the building to include storage for field lighting and other airport maintenance equipment, friction measuring equipment, rubber removal devices, and inspection or bird partol vehicles. Such buildings require site specific design, should be planned by an architectural and engineering firm familiar and airport needs and construction constraints. A.R.H.

N83-28284# United States Metric Board, Arlington, Va.
STATUS OF METRIC CONVERSION: A SURVEY OF US STANDARDS WRITING ORGANIZATIONS Interim Report
John M. Tascher and Sharon L. Blades May 1982 121 p
(AD-A123241) Avail: NTIS HC A06/MF A01 CSCL 14/2

This interim Report provides the results of a brief survey of metric conversion of all known U.S. standards development organizations. It provides a general status report and reference document on metric conversion in the standards development community. Author (GRA)

N83-28285# Bendix Corp., Kansas City, Mo.
COMPRESSION MACHINE CAVITY CONTROL Final Report
R. H. Floersch Jun. 1982 33 p refs

(Contract DE-AC04-76DP-00613)
(DE82-016356; BDX-613-2787) Avail: NTIS HC A03/MF A01

A system design that uses closed loop control of the hydraulic system of a compression transfer press (used to make filled elastomer parts) has resulted in improved accuracy and repeatability in the speed and pressure control segments during the critical forming stages before part cure. The design uses a microprocessor to supply set points and timing functions to the control system. The cascade control system consists of a specially designed outer loop controller that feeds set point information to the inner loop valve controller. Presented are the final hardware and software architectures for this design, as well as a report on system performance. DOE

N83-28286# California Univ., Berkeley. Lawrence Berkeley Lab.
INFILTRATION AND INDOOR AIR QUALITY IN A SAMPLE OF PASSIVE-SOLAR AND SUPER-INSULATED HOUSES
B. S. Wagner and A. H. Rosenfeld Jun. 1982 7 p refs Presented at 7th Natl. Passive Solar Conf., Knoxville, Tenn., 29 Aug. 1982
(Contract W-7405-eng-48)
(DE82-018516; LBL-14111; CONF-820819-8) Avail: NTIS HC A02/MF A01

Infiltration rates and indoor air quality were measured in 16 solar and super insulated houses in California. In this area careful construction can, at reasonable cost, reduce infiltration to 0.2 to 0.5 air changes per hour (40 to 100 min). To evaluate possible indoor air quality problems at these low infiltration rates, levels of three pollutions were monitored in early 1982 during weather cold enough to encourage occupants to keep their windows closed. No2, formaldehyde, and radon were measured using inexpensive, passive monitors. The blower door infiltration measurements are described and relationships between relevant building and occupant characteristics and observed levels of pollutants are discussed. These levels are also compared to current standards: implications for housing design and construction techniques are discussed, and further research needs are suggested. DOE

N83-28287# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.
PERFORMANCE RESULTS FROM PASSIVE-SOLAR RESIDENCES IN DENVER, COLORADO
Joel N. Swisher 1982 7 p refs
(Contract DE-AC02-77CH-00178)
(DE82-019126; SERI/TP-254-1644) Avail: NTIS HC A02/MF A01

The thermal performance of six passive solar residences in the Denver, Colorado metropolitan area is discussed. These buildings were monitored. A low cost approach to building thermal monitoring is explained, including the instrumentation hardware, the real time data reduction program, and the performance evaluation methodology. The buildings are described in detail, with monthly and seasonal summaries of weather data and the basic building energy flows. Detailed analysis efforts, using hourly data, are discussed briefly. DOE

N83-28288# California Univ., Berkeley. Center for Earthquake Engineering Research.
NEW APPROACHES FOR THE DYNAMIC ANALYSIS OF LARGE STRUCTURAL SYSTEMS
Edward L. Wilson Jun. 1982 83 p refs Sponsored by the Dept. of Navy and NSF
(PB83-148080; UCB/EERC-82/04) Avail: NTIS HC A05/MF A01 CSCL 13B

Four papers each presenting a new approach for the Dynamic Analysis of Large Systems are presented. 'An Eigensolution Strategy for Large Systems' presents a significant modification of the well-known subspace iteration method. 'Dynamic Analysis by Direct Superposition of Ritz Vectors' is a new technique for the automatic generation of Ritz Vectors, which for certain types of loading yield more accurate results than if the same number of exact eigenvectors are used. 'Three Dimensional Dynamic Analysis for Multi-Component Earthquake Spectra' presents a rational method for the analysis of structure subjected to arbitrary earthquake spectra. The last paper 'Finite Elements for the Dynamic Analysis of Fluid-Solid Systems' presents new elements for the idealization of fluids. GRA

N83-28289# Environmental Protection Agency, Research Triangle Park, N.C. Emission Standards and Engineering Div.
SYNTHETIC FIBER PRODUCTION FACILITIES: BACKGROUND INFORMATION FOR PROPOSED STANDARDS Final Report
Don R. Goodwin Oct. 1982 375 p refs
(Contract EPA-68-02-3060)
(PB83-153015; EPA-450/3-82-011A) Avail: NTIS HC A16/MF A01 CSCL 13B

Standards of performance to control emissions of volatile organic compounds (VOC) from new, modified, and reconstructed synthetic fiber production facilities are being proposed under section III of the Clean Air Act. This document contains information on the background and authority, regulatory alternatives considered, and environmental and economic impacts of the regulatory alternatives. Author (GRA)

N83-28290# Transportation Research Board, Washington, D.C.
AIRPORT AND HIGHWAY NOISE CONTROL, PLANNING AND ANALYSIS
Roswell A. Harris, Rudolf W. Hendriks, Mas Hatano, Robert D. Douglass, Jeffrey K. Drinkwater, Domenick J. Billera, Bruce C. Cunningham, Chris Brittle, Werner Broeg, Gunther-Fritz Haberle et al 1982 61 p refs
(PB83-153692; TRB/TRR-865; ISBN-0-309-03369; ISSN-0361-1981; LC-82-24696) Avail: NTIS HC A04/MF A01 CSCL 13B

Areas addressed are as follows: determination of effectiveness of noise barriers along I-285, Atlanta; evaluation of noise barriers; transparent noise barriers along I-95 in Baltimore City, Maryland; NJ-18 Freeway and Rutgers University classrooms -- unique construction noise mitigation experience; role of airport noise allocations in a regional airport system; comparison of irritation caused by noise generated by road traffic and aviation traffic; enhancement of highway noise modeling through computer graphics; highway construction noise modeling; and noise control through land use planning -- the Calgary case. GRA

32 COMMUNICATIONS

Includes land and global communications; communications theory; and optical communications.

For related information see also *04 Aircraft Communications and Navigation* and *17 Spacecraft Communications, Command and Tracking.*

N83-28291 Royal Aircraft Establishment, Farnborough (England).
POSSIBLE EFFECTS OF CITIZENS BAND RADIO TRANSMISSIONS ON SERVICE AIRBORNE RADIO NAVAIDS
J. P. Chamberlain 8 Jun. 1982 22 p refs
(RAE-TM-RAD-NAV-197; BR84193) Copyright. Avail: Issuing Activity

The potential detrimental effects of interference from CB equipment not within UK specification MPT 1320 on instrument landing systems (ILS) and other navigation aid systems is discussed. The frequent use of illegal amplitude modulation and power increases in the UK is commented on. The probability of error in ILS due to legal or illegal CB interference is analyzed. The risk of using illegal CB in vulnerable areas such as in proximity of an ILS equipped runway is demonstrated. Author (ESA)

N83-28292 Royal Aircraft Establishment, Farnborough (England).
AN IMPROVED SUSCEPTIBILITY TEST FOR THE EMC TESTING OF AEROSPACE EQUIPMENT
N. J. Carter 24 Aug. 1982 19 p refs In NEPALI
(RAE-TM-FS(F)-442; BR86022) Copyright. Avail: Issuing Activity

A revised conducted susceptibility EMC test for avionic equipment is described. The purpose is to confirm that RF

signals will not cause degradation of performance in interconnecting cable looms. The test covers the frequency range 50 kHz to 400 MHz and can be used in conjunction with existing EMC tests. Its implementation is described in a form suitable for direct incorporation in project requirements. Author (ESA)

N83-28293 Defence Research Information Centre, Orpington (England).
CALCULATION OF THE HF SKY-WAVE FIELD STRENGTH AND MAXIMUM USABLE FREQUENCY USING A PROGRAMMABLE POCKET CALCULATOR (HP97)
K. J. Hortenbach and H. Scholz Dec. 1982 33 p refs Transl. into ENGLISH of "Rundfunktech. Mitt. (West Germany)", v. 26, no. 2, 1982 p 52-62
(DRIC-T-6814; BR86254) Copyright. Avail: Issuing Activity

A calculation procedure is described. The propagation path can be selected to follow either the short or the long great circle and the propagation mode may be by F2- or E-layer reflection with up to ten skips. The field strength calculations comprise free-space attenuation, ionospheric absorption, ground-reflection losses and additional losses, as well as the gain of a curtain array antenna. The contribution covers the theoretical basis, instructions for the user, a comparison with other methods and the list of programs. Author (ESA)

N83-28294 Royal Signals and Radar Establishment, Malvern (England).
THE AF-CORAL: LANGUAGE FEATURES TO INTEGRATE MASCOT WITH CORAL 66
T. A. D. White Nov. 1982 13 p refs
(RSRE-82019; BR87251) Copyright. Avail: Issuing Activity

An addition to the computer programming language CORAL66 is described. It allows a programmer to write software for a MASCOT (Modular approach to software construction operation and test) designed system with improved clarity and program integrity. Author (ESA)

N83-28295*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
SPACE POWER TUBES - VERY MUCH ALIVE
Henry G. Kosmahl 1983 13 p Presented at CECON '83, Cleveland, 4-6 Oct. 1983; sponsored by the Inst. of Electrical and Electronics Engineers, Inc. and at the IEEE 1982 Intern. Electron Devices Meeting, San Franciso, 13-15 Dec. 1982
(NASA-TM-83425; E-1714; NAS 1.15:83425) Avail: NTIS HC A02/MF A01 CSCL 17B

The application of the traveling wave tubes (TWT), the backbone of all civilian and military space communication programs, to past, present and future satellites is discussed. Performance characteristics and the trends and challenges in the future are reviewed. Finally, a comparison with Solid State devices, as derived from fundamental laws, is made and limitations discussed. Author

N83-28296*# Ford Aerospace and Communications Corp., College Park, Md.
NASCOM NETWORK GROUND COMMUNICATIONS AVAILABILITY REPORT
May 1983 102 p
(Contract NAS5-27550)
(NASA-CR-172702; NAS 1.26:172702; X-843-83-4) Avail: NTIS HC A06/MF A01 CSCL 17B

A performance analysis of NASCOM Network circuits is presented. An objective of 99.80 percent availability has been established for all network circuits and an acceptable level of 99.50. A network narrative summary for the current month includes changes in network configurations, current month's totals for modes of service and trouble category losses, a discussion of trends, and significant losses that affected the performance indexes of individual or groups of circuits. A table and narrative summary of those circuits that failed to meet the objective of 99.80% availability for all network circuits and an acceptable level of 99.50. Lost time and interruption tables showing all circuits affected by outages, by trouble category, with their total time and events, scheduled operating hours, and individual availability indexes also are included. Selected circuits whose availabilities have or continue to affect the overall network availability are also analyzed. A.R.H.

N83-28297*# Ecosystems International, Inc., Gambrills, Md.
NON-URBAN MOBILE RADIO MARKET DEMAND FORECAST Final Report
Peter A. Castruccio and James Cooper 25 Jun. 1982 112 p
(Contract NAS3-23244)
(NASA-CR-168065; NAS 1.26:168065) Avail: NTIS HC A07/MF A01 CSCL 17B

A national nonmetropolitan land mobile traffic model for 1990-2000 addresses user classes, density classes, traffic mix statistics, distance distribution, geographic distribution, price elasticity, and service quality elasticity. Traffic demands for business, special industrial, and police were determined on the basis of surveys in 73 randomly selected nonurban counties. The selected services represent 69% of total demand. The results were extrapolated to all services in the non-SMSA areas of the contiguous United States. Radiotelephone services were considered separately. Total non-SMSA mobile radio demand (one way) estimates are given. General functional requirements include: hand portability, privacy, reduction of blind spots, two way data transmission, position location, slow scan imagery. S.L.

N83-28298# NeoComm Systems, Inc., La Canada-Flintridge, Calif.
SPEECH ENVELOPE NORMALIZATION, A METHOD TO IMPROVE SNR AND SUPPRESS NOISE IN PRESENT AND FUTURE RADIO SYSTEMS Final Report, 15 Mar. - 15 Sep. 1982
James C. Springett Fort Monmouth, N.J. Army Communications Electronics Command Dec. 1982 137 p refs
(Contract DAAB07-82-C-J066; DA Proj. 1L1-612701-AJ-92)
(AD-A124255; CECOM-82-J066-F) Avail: NTIS HC A07/MF A01 CSCL 17/2

Speech envelope normalization (EN) is a compression process that transforms dynamic speech waveforms into constant envelope signals which are optimum for transmission and reception using analog radio equipment. The EN process reduces dynamic range requirements, maximizes speech SNR, increases intelligibility, and suppresses noise. Envelope normalization theory and properties, EN circuit implementations, experimental evaluations, and applications analysis are covered. GRA

N83-28299# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
ISOLATED WORD RECOGNITION USING FUZZY SET THEORY M.S. Thesis
Gerard J. Montgomery Dec. 1982 296 p refs
(AD-A124851; AFIT/GE/EE/82D-74) Avail: NTIS HC A13/MF A01 CSCL 05/8

A unique algorithm was developed to recognize isolated words given the output of an extremely variable feature extraction process. Because of the high error rate of the acoustic processor, it was necessary to rely on the consistency of the sequences of phonemes, and the errors that typically occur for a given word to determine the word spoken. This was accomplished by generating error statistics and phoneme representations for each word in the vocabulary using a set of training speech files. The top five phoneme choices provided by the acoustic processor, and information indicating the accuracy of each choice, for each time segment of speech was implemented. Fuzzy set theory was used to combine this information with the error information obtained from the training files to determine the word spoken. GRA

N83-28300# Syracuse Univ., N. Y. Dept. of Electrical and Computer Engineering.
APPLICATION OF THE NEW E-FIELD SOLUTION TO A SURFACE OF REVOLUTION
Joseph R. Mautz and Roger F. Harrington Dec. 1982 87 p refs
(Contract N00014-76-C-0225)
(AD-A125045; SYRU/DECE/TR-82/14; TR-18) Avail: NTIS HC A05/MF A01 CSCL 20/3

A computer program is given to implement the new E-field

solution for the surface density of electric current and electric charge induced on a perfectly conducting surface of revolution immersed in the electromagnetic field of a plane wave. Unlike other E-field solutions, the new E-field solution works well for a surface whose maximum dimension is less than a hundredth of a wavelength. The computer program was written for axial incidence but can easily be modified to handle oblique incidence. Results obtained by using this computer program agreed with results obtained by using two other computer programs given here, one for Bouwkamp's power series solution for a conducting circular disk and one for the Mie series solution for a conducting sphere. Author (GRA)

N83-28301# Naval Research Lab., Washington, D. C.
ADAPTIVE-BANDWIDTH AUDIO INPUT FOR THE NARROWBAND LINEAR PREDICTIVE CODER
A. F. Thornhill and H. C. Murphy 18 Mar. 1983 21 p
(X0734CC; X1099CC)
(AD-A125728; NRL-MR-5036) Avail: NTIS HC A02/MF A01 CSCL 17/2

Digital voice communication systems using linear predictive coders lose intelligibility through failure to reproduce certain speech sounds. Sibilants may have spectra falling entirely outside the input passboard of the digital processor. An adaptive analog input filter allows sibilant energy to enter the processor. Although distortion is produced, intelligibility is improved. Author (GRA)

N83-28302# Naval Research Lab., Washington, D. C. Radar Analysis Branch.
A TWO-PRIORITY FRAME-SYNCHRONIZATION ALGORITHM Interim Report
J. O. Coleman 28 Feb. 1983 30 p refs
(SF12131691)
(AD-A125742; NRL-8661) Avail: NTIS HC A03/MF A01 CSCL 17/2

Most digital communication involves the transmission of data in distinct and identifiable groups of bits, sometimes referred to as frames. In many types of systems, separate control channels for marking frame boundaries are unavailable and frame synchronization information must be embedded in the data stream. The standard techniques for synchronization are inadequate in situations in which both of the following are true: (1) data can be transmitted only occasionally and in amounts not necessarily corresponding to frames; (2) data frames are divided into two categories, high priority and low priority, with high priority indicating time-critical information. In these situations the transmitter data queue should operate as a priority queue; i.e., it should operate in a first in first out fashion except that when high priority bits enter the queue they immediately move past any low priority bits already in the queue. Because this can result in a high priority frame being inserted into the middle of a partially transmitted low priority frame, the synchronization algorithm in this context needs to do two things in a compatible way: delimit low priority frames and mark high priority frames in such a way that they can be detected anywhere in the low priority data stream. This report describes such an algorithm. GRA

N83-28303# Stanford Univ., Calif. Dept. of Operations Research.
QUEUEING MODELS FOR DESIGN DIGITAL COMMUNICATION SATELLITE SYSTEMS
Frederick S. Hillier and Bijan Jabbari Dec. 1982 31 p refs
(Contract N00014-75-C-0561; Grant NSF ECS-80-17867; NR Proj. 047-200)
(AD-A125759; SU-TR-209; SU-TR-71) Avail: NTIS HC A03/MF A01 CSCL 17/2

Satellites have an enormous potential for providing efficient communication links between many widely scattered ground stations. By interpreting the messages as customers in a queueing system, an unusual type of queueing model can be formulated to describe this process. The expected waiting time of the messages in the queue can then be derived for different configurations in order to guide the design of the system. Author (GRA)

N83-28304# Royal Aircraft Establishment, Farnborough (England).
AN IMPROVED SUSCEPTIBILITY TEST FOR THE EMC TESTING OF AEROSPACE EQUIPMENT
N. J. Carter Aug. 1982 19 p refs
(AD-A125362; RAE-TM-FS(F)-442; DRIC-BR-86022) Copyright. Avail: NTIS HC A02/MF A01 CSCL 09/3

This Memorandum describes a revised conducted susceptibility EMC test for avionic equipment. The test covers the frequency range 50 kHz to 400 MHz and can be used in conjunction with existing EMC tests. Its implementation is described in a form suitable for direct incorporation in project requirements. GRA

N83-28305# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
COMPUTER RECOGNITION OF PHONETS IN SPEECH M.S. Thesis
Daniel D. Martin Dec. 1982 240 p refs
(AD-A125360; AFIT/GE/EE/82D-46) Avail: NTIS HC A11/MF A01 CSCL 09/2

This project generated phonetic units, termed 'phonets,' from digitized speech files. The time file was converted to feature space using the Fourier Transform, and phonet occurrences were detected using Minkowski One and Two distance measures. Phonet matches were detected and ranked for each phonet compared against a template file. Phonet short-time energy was included in the output files. An algorithm was developed to partition feature space and its performance was evaluated. Author (GRA)

N83-28306# Rockwell International Science Center, Thousand Oaks, Calif. Science Center.
RESEARCH ON FERROELECTRIC MATERIALS FOR MILLIMETER WAVE APPLICATION Semiannual Technical Report, 1 Mar. - 31 Aug. 1982
R. R. Neurgaonkar, L. E. Cross, W. F. Hall, and W. W. Ho Dec. 1982 26 p refs
(Contract F49620-81-C-0090; ARPA Order 4240; AF Proj. 2306) (AD-A125570; SC5344.6SA; AFOSR-83-0105TR; SATR-2) Avail: NTIS HC A03/MF A01 CSCL 20/14

This technical report presents the results of the second six months of a research program on ferroelectric materials for phase control applications in millimeter wave radar systems. Originally a one-year program, this effort has been extended to fifteen months to take advantage of materials development activities in related programs. The major accomplishments in the current period include growth and preparation of several ferroelectric materials, and high frequency dielectric characterization of high purity single crystals of Sr.6Ba.4Nb206 (SBN:60). All systems examined to date exhibit high dielectric loss at millimeter wavelengths, the minimum being tan 11 0.3 near 40 GHz for a high purity SBN: 60 sample. The generality of this observation, when coupled with high sample-to-sample variability, suggests a commonly occurring extrinsic factor, such as growth defects, as the key element. How the frequency scale for polarization flucuations is tied to such extrinsic influences remains to be explored. A systematic study of the influence of defect structure on microwave dielectric properties of ferroelectrics is probably the most appropriate next step. GRA

N83-28307# Naval Research Lab., Washington, D. C. Communication Systems Engineering Branch.
USE OF DECODER INFORMATION FOR DETECTION OF START AND END OF TRANSMISSION IN THE ANDVT HF MODEM Interim Report
W. M. Jewett and R. Cole, Jr. 24 Mar. 1983 34 p refs
(AD-A125727; NRL-MR-5043) Avail: NTIS HC A03/MF A01 CSCL 17/2

Algorithms have been developed for determining the start-of-transmission and end-of-transmission for the ANDVT HF modem. Use is made of statistical characteristics of the error patterns in the soft decision decoder for the Golay (24,12) code and are adaptive to the signal conditions, providing superior performance over the use of signal-to-noise estimates in the presence of narrowband interference. Author (GRA)

N83-28308# Naval Postgraduate School, Monterey, Calif.
POSITIONING OF JAMMING AIRCRAFT USING THE INTEGRATED REFRACTIVE EFFECTS PREDICTION SYSTEM M.S. Thesis
Thomas W. White Oct. 1982 115 p refs
(AD-A125644) Avail: NTIS HC A06/MF A01 CSCL 17/4

Tactical ECM planning has historically considered only horizontal positioning of self-protection and standoff jamming systems. Failure to consider vertical positioning of the jammer, and how the environment affects that positioning, can lead to substantially reduced jamming effectiveness. The effects of radar and jamming system antenna patterns and environmental considerations are discussed. The Integrated Refractive Effects Prediction System (IREPS) incorporates these effects, but not in a form that is convenient for ECM planning. However, as it is now configured, IREPS can be a useful tool. A step-by-step approach for using IREPS and the jamming equations to assist the ECM planner is given. Sample calculations for self-protection and standoff jamming under actual environmental conditions are provided. Author (GRA)

N83-28309# Oregon Graduate Center for Study and Research, Beaverton.
WAVE PROPAGATION IN PARTICULATE MEDIA: MULTIPLE SCATTERING OF OPTICAL PULSES IN SCALE MODEL CLOUDS Technical report, 1 Sep. 1979 - 31 Aug. 1982
Richard A. Elliott 8 Mar. 1983 60 p refs
(Contract N00014-79-C-0897)
(AD-A126123) Avail: NTIS HC A04/MF A01 CSCL 20/14

The results of experiments to measure the delay, temporal stretching, attenuation and spatial spreading of optical pulses in scale model clouds are reported. The model clouds consisted of diiodomenthane/water or paraffin oil/water emulsions maintained in a rotating scattering cell to prevent settling of the droplets. The optical pulses were 532 nm, 25 ps duration pulses generated by a frequency doubled, passively mode locked Nd:YAG laser and were detected with a 10 ps resolution streak camera. The measurements of the delay in the mean arrival time of the pulses due to multiple scattering are the first ever measured directly.
Author (GRA)

N83-28310# Bendix Corp., Kansas City, Mo.
SOFTWARE DRIVER FOR INTERSTATE ELECTRONICS VRM-102 VOICE-RECOGNITION MODULE
G. M. Hale Apr. 1982 58 p refs
(Contract DE-AC04-76DP-00613)
(DE82-013886; BDX-613-2778) Avail: NTIS HC A04/MF A01

An assembly-language driver for Interstate Electronics VRM-102 Voice Recognition Module (VRM) has been created to simplify applications programming for the VRM. Written in 8080 mnemonics, the driver serves as a model for any system communication with a VRM unit. DOE

N83-28311# Stanford Univ., Calif.
NOTE ON CYLINDRICAL WAVES WHICH PROPAGATE AT THE VELOCITY OF LIGHT
N. M. Kroll 1982 5 p refs Presented at Workshop on Laser Acceleration of particles, Los Alamos, N.M., 18 Feb. 1982
(Contract DE-AC03-76SF-00515)
(DE82-012921; SU-SLAC-Pub-2904; CONF-820241-1) Avail: NTIS HC A01/MF A01

The continuous linear acceleration of ultra relativistic particles in free space by an electromagnetic field requires the presence of a cylindrical wave component with phase velocity that differs negligibly from c and with non-vanishing electric field component in the direction of propagation. Certain geometries proposed for laser driven acceleration fail to satisfy these requirements. On the other hand, complex wave number plane wave fields which do satisfy these requirements were constructed. It is pointed out that any cylindrical wave with the required properties can be formed from superposition of plane waves of the form which was obtained. The situation is analogous to that which occurs in standard waveguide theory. There it is also true that any waveguide mode can be constructed by superposition of plane waves. Nevertheless, the study of the general properties of cylindrical waves has proved to be a very powerful tool for the analysis of waveguides and similar structures. DOE

N83-28312# Sandia Labs., Albuquerque, N. Mex. Systems Engineering Div.
VOICE SYNTHESIS APPLICATION
Philip C. Lightstone and William M. Davidson Apr. 1982 40 p refs
(Contract DE-AC04-76DP-00789)
(DE82-015482; SAND-82-0415) Avail: NTIS HC A03/MF A01

The military detection assessment laboratory houses an experimental field system which assesses different alarm indicators such as fence disturbance sensors, MILES cables, and microwave Racons. A speech synthesis board which could be interfaced, by means of a computer, to an alarm logger making verbal acknowledgement of alarms possible was purchased. Different products and different types of voice synthesis were analyzed before a linear predictive code device produced by Telesensory Speech Systems of Palo Alto, California was chosen. This device is called the Speech 1000 Board and has a dedicated 8085 processor. A multiplexer card was designed and the Sp 1000 interfaced through the card into a TMS 990/100M Texas Instrument microcomputer. It was also necessary to design the software with the capability of recognizing and flagging an alarm on any 1 of 32 possible lines. The experimental field system was then packaged with a dc power supply, LED indicators, speakers, and switches, and deployed in the field performing reliably. DOE

N83-28313# Forschungsinstitut der Deutschen Bundespost, Darmstadt (West Germany).
COMPARISON OF DIFFERENT TYPES OF DIGITAL TRANSMISSION OVER METAL CONDUCTOR PAIRS NOT SUBJECT TO CHANNEL CROSSTALK
Guenter Morgenstern Nov. 1982 77 p refs In GERMAN; ENGLISH summary
(FI-444-TBr-10) Avail: NTIS HC A05/MF A01

Digital transmission over metal conductors was studied, using the ratio of the square of the eye opening to the noise power at the output of an ideal equalizer as quality measure. Quality was plotted as a function of the duration of the rectangular pulses, the roll-off factor (r), the cosine transfer function, and the attenuation of the metal conductor at the Nyquist frequency of the binary transmission. For $r = 0.3$ and a cable attenuation between 105 dB and 130 dB, quaternary transmission gives the best results,while modified triobinary and quinary give the worst.
Author (ESA)

N83-28314# European Space Agency, Paris (France).
PLANNING OF A C-BAND PULSE DOPPLER RADAR WITH POLARIZATION DIVERSITY FOR ATMOSPHERIC RESEARCH IN THE MESOSCALE RANGE
Herbert Schuster Dec. 1982 61 p refs Transl. into ENGLISH of "Plannung Eines C-Band-Puls-Doppler-Radars mit Veraenderbarer Polarisation fuer Die atmosphaerenforschung im mesoskaligen Bereich" Rept. DFVLR-Mitt-81-28 DFVLR, Oberpfaffenhofen, West Germany, Sep. 1981 Original report in GERMAN previously announced as N82-19445
(ESA-TT-750; DFVLR-Mitt-81-28; ESA-98017) Avail: NTIS HC A04/MF A01; original German version available from DFVLR, Cologne DM 11,80

Radar system specifications for cloud physics studies are outlined. A semimobile system, comprising computer controlled pulse Doppler radar and digitized signal processing is recommended. Design requirements arising from the need to collect data on type of precipitation, precipitation intensity and distribution, drop spectrums, distribution of ice and water particles within clouds, wind fields, and turbulence factors are discussed. Data must be determined with a high degree of space and time resolution for the initialization and proving of mesoscale and convective models.
Author (ESA)

N83-28315# European Space Agency, Paris (France).
OFFSET REFLECTOR ANTENNAS: DESIGN, COMPUTATION, CONSTRUCTION AND PATTERN MEASUREMENTS
Dieter Klement, Hans-Juergen Steiner, and Volker Stein Dec. 1982 77 p refs Transl. into ENGLISH of "Entwurf, Berechnung, Konstruktion und Vermessung von Offset-Reflektorantennen" rept. DFVLR-Mitt-81-33 DFVLR, Oberpfaffenhofen, West Germany, Nov. 1981
(ESA-TT-770; DFVLR-Mitt-81-33) Avail: NTIS HC A05/MF A01; original German version available from DFVLR, Cologne DM 28,80

The test of active and passive methods for the purpose of object recognition in the frequency region from 32 to 90 GHz, requiring a series of antennas with different half beam widths and with an axial symmetric radiation pattern for orthogonal linear polarization is considered. These requirements are met by the principle of a single offset-reflector antenna with a corrugated feed. The design procedure for this antenna system is described. Computation of the scattered pattern is based on the current distribution method. The primary pattern is determined by experiment as well as theory. For construction of the antennas, a fiberglass technique was applied, combined with a special method for shaping the parabolic reflectors. Measured and computed results show the validity of the established design rules.
Author (ESA)

N83-28316# Physics Lab. RVO-TNO, The Hague (Netherlands). Research Group 4: Microwaves.
COMPARISONS OF SIMULTANEOUSLY RECORDED SEA-CLUTTER RETURNS AT J- AND K-BAND FREQUENCIES (16.5 AND 35 GHz)
H. Sittrop Dec. 1982 19 p refs
(PhL-1982-61; TDCK-77305) Avail: NTIS HC A02/MF A01

Results of simultaneously recorded measurements in October 1979 in Stadt Norway are given. Those measurements which can be considered as reliable to determine absolute values of the radar cross section (RCS) per unit area, present good agreement with the results of computations obtained with the earlier developed experimental sea-clutter model. Comparisons between the RCS at J- and K-band indicate that J-band return is of the order of 1 to 2 dB larger than K-band return. Author (ESA)

N83-28317# Physics Lab. RVO-TNO, The Hague (Netherlands). Research Group 6: Signal Processing.
MEASURING TARGET POSITION WITH THE FUCAS PHASED-ARRAY RADAR SYSTEM
G. A. vanderSpek Nov. 1982 48 p refs
(Contract A74/K/077)
(PhL-1982-64; TDCK-77306) Avail: NTIS HC A03/MF A01

An experimental system with the ability to measure the position of targets within the main radar antenna beam by applying monopulse processing to the echoes of a single transmission is presented. The position estimation process is described and the results of an experiment to determine its performance are presented. The experiment was done with an almost stationary helicopter, so that the effects of strong target glint had to be considered. The influence of the application of incoherent echo integration, frequency agility and moving target indication are examined. A single target echo from within the half power beam contour is sufficient to provide an accurate position estimate within 4% rms error. The applications of frequency agility reduces the effect of target glint. The monopulse performance can be improved by using a set of monopulse relations. Author (ESA)

N83-28318# Essex Univ., Colchester (England). Optical Communications Lab.
MATCHED FILTERING OF EQUIVALENT-TIME SIGNALS
John J. OReilly Sep. 1981 7 p refs
(Rept-171) Avail: NTIS HC A02/MF A01

Equivalent-time signal acquisition in the presence of stationary additive noise is contrasted with real time transient recording. It is shown how the substantial noise decorrelation encountered with equivalent time methods can markedly influence the form of an optimum postprocessor and the signal to noise ratio attainable. For equivalent-time systems the attainable signal to noise ratio is proportional to sample density while for real time systems it is insensitive to sample density within the limits of the sampling theorem. Consequently, a higher signal to noise ratio can be obtained by processing an equivalent time signal rather than a real time signal with the same number of samples. Author (ESA)

N83-28026*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
THE JPL 1.5-METER CLEAR APERTURE ANTENNA WITH 84.5 PERCENT EFFICIENCY
A. G. Cha *In its* The Telecommun. and Data Acquisition Rept. 15 May 1983 p 1-14 refs (For primary document see N83-28025 17-12)
Avail: NTIS HC A09/MF A01 CSCL 20N

N83-28028*# Jet Propulsion Lab., California Inst. of Tech., Pasadena. Communications Systems Research Sect.
NODE SYNCHRONIZATION FOR THE VITERBI DECODER
G. Lorden, R. McEliece, and L. Swanson *In its* The Telecommun. and Data Acquisition Rept. 15 May 1983 p 22-35 refs (For primary document see N83-28025 17-12)
Avail: NTIS HC A09/MF A01 CSCL 17B

N83-28033*# Jet Propulsion Lab., California Inst. of Tech., Pasadena. Radio Frequency and Microwave Subsystems Sect.
RF DESIGN AND PREDICTED PERFORMANCE FOR A FUTURE 34-METER SHAPED DUAL-REFLECTOR ANTENNA SYSTEM USING THE COMMON APERTURE X-S FEEDHORN
W. F. Williams *In its* The Telecommun. and Data Acquisition Rept. 15 May 1983 p 74-84 refs (For primary document see N83-28025 17-12)
Avail: NTIS HC A09/MF A01 CSCL 20N

N83-28038*# Jet Propulsion Lab., California Inst. of Tech., Pasadena. Tracking Systems and Applications Sect.
RADIO INTERFEROMETRIC DETERMINATION OF SOURCE POSITIONS, INTERCONTINENTAL BASELINES, AND EARTH ORIENTATION WITH DEEP SPACE NETWORK ANTENNAS: 1971 TO 1980
J. B. Thomas, O. J. Sovers, J. L. Fanselow, E. J. Cohen, G. H. Purcell, Jr., D. H. Rogstad, L. J. Skjerve, and D. J. Spitzmesser *In its* The Telecommun. and Data Acquisition Rept. 15 May 1983 p 128-155 refs (For primary document see N83-28025 17-12)
Avail: NTIS HC A09/MF A01 CSCL 20N

N83-28039*# Jet Propulsion Lab., California Inst. of Tech., Pasadena. TDA Planning Office.
LIMITS TO ARRAYING
J. W. Layland *In its* The Telecommun. and Data Acquisition Rept. 15 May 1983 p 156-164 ref (For primary document see N83-28025 17-12)
Avail: NTIS HC A09/MF A01 CSCL 20N

N83-28040*# Jet Propulsion Lab., California Inst. of Tech., Pasadena. TDA Technology Development Office.
DEVELOPMENTS RELATED TO THE FUTURE USE OF THE 32-GHz ALLOCATION FOR DEEP SPACE RESEARCH
N. F. deGroot *In its* The Telecommun. and Data Acquisition Rept. 15 May 1983 p 165-175 (For primary document see N83-28025 17-12)
Avail: NTIS HC A09/MF A01 CSCL 20N

N83-28092 ERA Ltd., Leatherhead (England).
THE PERFORMANCE OF VHF AND UHF AERIALS MOUNTED ON CARBON FIBER COMPOSITE MATERIALS
A. McHale *In its* Investigation of the RF Properties of Carbon Fiber Composite Mater. Jul. 1982 19 p (For primary document see N83-28084 17-24)
Avail: Issuing Activity

33 ELECTRONICS AND ELECTRICAL ENGINEERING

Includes test equipment and maintainability; components, e.g., tunnel diodes and transistors; microminiaturization; and integrated circuitry.

For related information see also *60 Computer Operations and Hardware* and *76 Solid-State Physics.*

N83-28319* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
ELECTRICAL POWER GENERATING SYSTEM Patent
Frank J. Nola, inventor (to NASA) Issued 14 Jun. 1983 4 p Filed 16 Mar. 1981
(NASA-Case-MFS-25302-1; US-Patent-4,388,585; US-Patent-Appl-SN-243683; US-Patent-Class-322-47; US-Patent-Class-322-29; US-Patent-Class-322-35; US-Patent-Class-322-95) Avail: US Patent and Trademark Office CSCL 09C

A power generating system for adjusting coupling an induction motor, as a generator, to an A.C. power line wherein the motor and power line are connected through a triac is described. The triac is regulated to normally turn on at a relatively late point in each half cycle of its operation, whereby at less than operating speed, and thus when the induction motor functions as a motor rather than as a generator, power consumption from the line is substantially reduced.

Official Gazette of the U.S. Patent and Trademark Office

N83-28320 Michigan Univ., Ann Arbor.
MEANDER ANTENNAS Ph.D. Thesis
Jalil-Agha RashedMohassel 1982 145 p
Avail: Univ. Microfilms Order No. DA8225024

Meander antennas are a class of wire structures made from meander sections intended to reduce the resonant length of the antenna. Each half section is formed when the wire is folded three times over its course and a complete section is made when two half sections are connected back to back. The resonant frequency and other antenna characteristics depend primarily on the number of sections per wavelength N and the separation of the folded arms w. Usually w is kep small in comparison to the length of the antenna and therefore the undesirable radiation due to the horizontal portions are negligible. In this case the reduction in the resonant length depends on N and is typically 25 to 50 percent. The efficiency is affected only by the ohmic losses in the wire and the bandwidth of the antenna is generally less than a conventional monopole but comparable to that of other size reduction techniques such as base loaded antennas.

Dissert. Abstr.

N83-28321 Lehigh Univ., Bethlehem, Pa.
A STUDY OF MINORITY CARRIER INJECTION ON THE METAL/TUNNEL-OXIDE/n-SI STRUCTURE Ph.D. Thesis
Fu-Lung Hsueh 1982 283 p
Avail: Univ. Microfilms Order No. DA8218689

The metal/tunnel-oxide/n-silicon structure was studied under conditions of minority carrier injection. Two device structures were selected for study: the metal/tunnel-oxide/n/p(+)(MISS) switching device, and a P-channel MOSFET structure in which the drain is replaced by a tunnel-oxide contact. In the first device, minority carrier injection to the Si-SiO2 interface is a result of the inherent internal feedback loop which forward-biases the p(+)n junction. In the latter structure, injection is achieved from the source contact through the MOSFET channel. In this case the injection level can be independently and accurately controlled via the MOS gate electrode. In addition, the electron and hole tunnel currents can be measured independently. Experimental results from the MISS devices suggest that for a given tunnel-oxide thickness and area, the magnitude of the switching voltage and holding current increases with isolated p(+)n junction area, whereas the switching current remained constant. Dissert. Abstr.

N83-28322 Northwestern Univ., Evanston, Ill.
A PHYSICAL MODEL FOR THE PHOTOVOLTAIC EFFECTS OBSERVED IN LANGMUIR MODEL MEMBRANE STRUCTURES Ph.D. Thesis
John Holoyda 1982 242 p
Avail: Univ. Microfilms Order No. DA8225936

In recent years there was increasing interest in the photovoltaic properties of Lagmuir-Blodgett thin films. These organic layered structures represent a new type of biomaterial in that different types of chromophore molecules are precisely ordered relative to the other molecules composing the molecular structure. The Langmuir-Blodgett structures consist primarily of built-up layers on N-(4-nitrobenzo)-2-oxa-1,3 diazole phosphatidyl ethanolamine. The organic molecular layers are sequentially deposited between aluminum electrodes. The visible spectrum was employed for quantum stimulation. Electrical transport characteristics were first investigated and interpreted without light energy incident on the sample. The thin films generate a dark internal potential which has an upper limit of 1.37 volts; under monochromatic illumination a photo-e.m.f. of a few volts above the dark potential is observed in many samples. Dissert. Abstr.

N83-28323 Michigan Univ., Ann Arbor.
FREQUENCY CONVERSION AND NOISE IN MILLIMETER-WAVE TRANSIT-TIME DEVICES Ph.D. Thesis
Robert Oscar Grondin 1982 323 p
Avail: Univ. Microfilms Order No. DA8224958

A theoretical study of frequency conversion and noise in millimeter wave transit time devices is made. In particular the performance of BARITT devices as mixers and detectors in the 30- to 100-GHz range is studied. Additionally, some potential limitations in the basic model of a transit time device are also investigated. The performance of BARITT mixers is based on a mitrix formulation of frequency conversion and noise in a transit time device. This matrix formulation is developed by extending conventional Schottky barrier mixer models. Additionally, various burnout mechanisms and video detection are also considered. The BARITT is found to be a much more durable and burnout resistant device than the Schottky barrier diode. The results obtained here indicate that it will probably be competitive with Schottky barrier diodes in low noise video detection and mixing applications. However, the BARITT device may be very useful in applications where high burnout capability and reasonable sensitivity are needed. Dissert. Abstr.

N83-28324 Michigan Univ., Ann Arbor.
COMPUTER MODELING OF MILLIMETER WAVE IMPATT DIODES Ph.D. Thesis
Robert Kingsbury Froelich 1982 162 p
Avail: Univ. Microfilms Order No. DA8224951

A computer model of millimeter was Si IMPATT diodes was developed, which incorporates a more detailed description of charge transport than that given by the conventional drift and diffusion approximation. The new model is based on principles of conservation of energy and momentum, and provides a second order description of the time and space evolution of the carrier velocity distribution. The relevant transport equations are the first three velocity moments of the phase space transport equation. Terms accounting for the effects of collisions incorporate energy dependent relaxation times and ionization rates. These functions of energy were evaluated by using the requirements of consistency with experimental measurements of transport parameters. Finite difference approximations to the transport equations were developed, and problems of stability and accuracy of the approximations were analyzed and overcome. Dissert. Abstr.

N83-28325 Cornell Univ., Ithaca, N. Y.
PRODUCTION AND CHARACTERIZATION OF ION BEAMS FROM MAGNETICALLY INSULATED DIODES Ph.D. Thesis
Jesse Martin Neri 1982 359 p
Avail: Univ. Microfilm Order No. DA8228455

The operation of magnetically insulated diodes and the characteristics of the resulting ion beams were investigated using

two pulsed power generators, LYNX at the 10 to the 9th power level, and Neptune at the 10 to the 10th power. LYNX is a small magnetically insulated diode driven directly by a Marx bank. By changing the materialused as the surface flashover ion souce, the majority ion species generated by the diode could be chosen. Ion beams produced so far by this device are: protons, lithium, boron, carbon, sodium, strontium, and barium. Typical beam parameters for the ion beams are peak energies of 300 keV, current densities of 40-60 A/square cm and pulse durations of 300 to 400 nsec. The ion beam uniformity, divergence, and reproducibility were shown to be a function of the surface flashover source geometry. Finally, the LYNX ion beam was also used to anneal silicon crystals and other materials science experiments. Dissert. Abstr.

N83-28326 Royal Aircraft Establishment, Farnborough (England).
THE COOLING OF PRINTED CIRCUIT BOARD MOUNTED COMPONENTS USING COPPER LADDER HEAT CONDUCTION TO A COLD WALL
I. C. Dale 1 Sep. 1982 40 p refs
(RAE-TR-82092; RAE-FS-(F)-184; BR86157) Copyright. Avail: Issuing Activity

A series of experimental tests, designed to investigate the cooling of printed circuit board (PCB) mounted dual-in-line (DIL) components within an avionic box using the copper ladder/cold wall technique is described. Areas of investigation include avionic box orientation, side wall conduction, top plate finning, mixed air-wash, avionic power reduction, cooling air temperature reduction, cooling air mass flow rate reduction, cold wall heat pick-up and avionic box insulation. Results were obtained from thermocouple temperature measurements. The use of an aluminum alloy interplate to cool two adjacent PCBs is discussed. Results in graphic form are included together with a list of conclusions on the effects of all the major parameters considered. Author (ESA)

N83-28327 National Physical Lab., Teddington (England). Div. of Materials Applications.
THE NPL SOLDERING SCIENCE AND TECHNOLOGY CLUB: ITS BASIS AND ITS AIMS
Colin Lea Dec. 1982 13 p
(NPL-DMA(A)-60; ISSN-0143-7313) Copyright. Avail: Issuing Activity

The activities of the Division of Material Applications are summarized emphasizing the contributions of the Surfaces and Interfaces section to metal forming technologies such as adhesive technology, diffusion bonding and friction welding as well as soldering. The origins, aims and benefits of the Soldering Science and Technology Club are described. Research goals in the printed circuit soldering technology are commented on. Author (ESA)

N83-28328 National Physical Lab., Teddington (England). Div. of Electrical Science.
MEASUREMENT OF EDDY CURRENT CONDUCTIVITY
A. C. Lynch, A. E. Drake, and C. H. Dix Feb. 1983 9 p
(NPL-DES-77; ISSN-0143-7305) Copyright. Avail: Issuing Activity

The method described allows the resistivity of an annular metallic specimen, as measured by eddy-current losses at frequencies in the range 10 to 100 kHz, to be measured in units traceable to national standards. The apparatus is based on a Heydweiller bridge which measures the mutual inductance and mutual resistance of two toroidal windings on the annular specimen. Corrections are needed for the effects of self-capacitance and the capacitance between windings. The overall uncertainty in the measurement is 0.4% at 10 kHz to 0.6% at 100 kHz and it could not easily be improved. It may be adequate for present purposes. Author (ESA)

N83-28329*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
POWER CONTROL FOR ac MOTOR Patent Application
Richard W. Dabney, inventor (to NASA) Filed 14 Jun. 1983 15 p
(NASA-Case-MFG-25862; US-Patent-Appl-SN-504345) Avail: NTIS HC A02/MF A01 CSCL 09C

A motor controller employing a triac through which power is supplied to a motor and wherein the open circuit voltage appearing across the triac controls the operation of a timing circuit which triggers on the triac at a time following turn off which varies inversely as a function of the amplitude of the open circuit voltage to the triac is discussed. NASA

N83-28330*# Alabama Univ., Huntsville. School of Mathematical and Natural Sciences.
ELECTRICAL RESISTIVITY OF COMPOSITE SUPERCONDUCTORS Final Report, Aug. 1981 - Aug. 1982
Jack H. Davis and Jonathan A. Lee Apr. 1983 42 p refs
(Contract NAS8-33810)
(NASA-CR-170793; NAS 1.26:170793) Avail: NTIS HC A03/MF A01 CSCL 09C

In addition to its superconducting properties, a superconductor is usually characterized by poor thermal conductivity and relatively high electrical resistivity in the normal state. To remedy this situation a study of superconducting properties of Cu-rich CU-Nb wires prepared by directionally solidified and cold-rolled technique was conducted. Some of the specimens were prepared by melting, directional solidification and diffusing in Tin. A total of 12 wire specimens was tested. Each specimen was analyzed by plotting experimental data into the following curves: the graph of the residual resistivity as a function of the specimen current at 4.3 K; and the graph of the electrical resistivity as a function of the temperature at a constant current. Author

N83-28331# Rockwell International Corp., Thousand Oaks, Calif.
HIGH SPEED CCD DESIGN Final Technical Report, 6 Aug. 1980 - 6 Nov. 1981
J. A. Higgins Hanscom AFB, Mass. RADC Dec. 1982 68 p refs
(Contract F19628-80-C-0152; AF Proj. 2305)
(AD-A125371; RADC-TR-82-321) Avail: NTIS HC A04/MF A01 CSCL 09/2

The use of GaAs (Gallium Arsenide) in a CCD (Charge Coupling Device) structure should provide good transfer efficiencies at clock frequencies in excess of 1GHz. These high clock speeds imply that high speed analog signal processing algorithm can be implemented which can be useful in the front ends of high speed communication systems. This effort has been designed to investigate the fabrication of planar CCDs using ion implant technology and to design and fabricate support circuitry and RF hardware necessary to drive 4 phase CCDs at clock frequencies higher than 1GHz. GRA

N83-28332# Rome Air Development Center, Griffiss AFB, N.Y.
PART DERATING GUIDELINES (INTERIM) FOR ESD SYSTEMS DEVELOPMENT
Hanscom AFB, Mass. ESD Aug. 1982 87 p
(AD-A125347; ESD-TR-82-417) Avail: NTIS HC A05/MF A01 CSCL 09/1

This document establishes part derating to be implemented on AFSC/ESD contract. These guidelines were prepared for ESD by RADC/RB and reflect the design derating criteria prepared for them under contract F30602-81-V-0073, as well as other RADC data. Established derating values for the majority of devices in MIL-HDBK-217, and a suggested approach for verification of derating parameters are included. Derating verification testing in Section 23 should be utilized to the extent agreed upon by the contractor and Air Force, unless otherwise specified in the contract. GRA

N83-28333# Harris SAI, Inc., Ann Arbor, Mich.
SIMULATION OF DISTRIBUTED-EMISSION AND INJECTED-BEAM CROSSED-FIELD AMPLIFIERS. PART 2: THE CROSSED-FIELD ELECTRON GUN Final Technical Report, 1 Mar 1977 - 29 Feb. 1980
Donald M. MacGregor, Thomas P. Fontana, and Joseph E. Rowe Apr. 1980 257 p refs

(Contract F49620-77-C-0091; AF Proj. 2305)
(AD-A125340; AFOSR-80-0554TR) Avail: NTIS HC A12/MF A01 CSCL 09/1

Numerical models developed for the crossed-field electron gun predict the current and the beam shape and stability for varied voltages or magnetic field. These programs use a deformable triangular mesh to reproduce the realistic electrode boundaries. A static iterative analysis predicts beam currents about 5 percent higher than measured for a short Kino gun, but is not stable for long cathodes with returning electrodes. However, the alternative time-dependent method predicts a stable, well-defined beam in both cases. Excess shot noise in a long-cathode crossed-field gun is believed to be due to cycloiding electrons which return to the cathode from well beyond the potential minimum. Of three theories compared here, only the Ho and Van Duzer model includes these electrons and predicts an instability. With added shot noise the computer simulation may be capable of reproducing the effect. Experimental measurements have been obtained by subcontract for a Northrop gridded crossed-field gun. The two dimensional time-dependent analysis, which ignores the grids, predicts the beam current with good order-of-magnitude agreement. GRA

N83-28334# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
ANALYSIS OF THE INDUCED CURRENTS ON A SECTION OF PARALLEL WIRES IN FRONT OF A GROUND PLANE M.S. Thesis
Thomas W. Godowsky Dec. 1982 120 p refs
(AD-A125646; AFIT/GE/EE/82D-35) Avail: NTIS HC A06/MF A01 CSCL 09/1

This investigation determines the induced currents on a finite sized array of parallel wires then illuminated by a plane wave with varying incidence angles by the method of moments. The arrays considered are of various spacings, lengths, and widths, ranging from 5 to 36 wires per wavelength, and one to two wavelengths in length. The effects of a ground plane parallel to the array, and located one quarter wavelength away, is also studied. The analysis is accomplished by the method of moments using piecewise sinusoidal expansion functions and Galerkin's method. An algorithm is developed to accomplish the integration and matrix inversion. It is written general enough for the user to specify: number of wires, number of segments, wire length, wire diameter, wire spacing, spacing above the ground plane, frequency, and magnitude of incident electric field. The results illustrate the various effects that changing the wire spacing, wire length, number of segments, and incidence angle have upon the induced current. The results are also compared to the modified physical optics approximation. The results of this investigation indicate that the moment method is accurate enough to produce very reasonable approximations of the induced current for most applications. Author (GRA)

N83-28335# Oak Ridge Gaseous Diffusion Plant, Tenn.
DETECTION OF ELECTRICAL POBLEMS USING AN INFRARED SCANNER
W. K. Simon and G. A. Whitaker 1982 5 p refs Presented at the IEEE Petrol. and Chem. Ind. Comm. Meeting, St. Louis, 30 Aug. - 2 Sep. 1982
(Contract W-7405-eng-26)
(DE82-013716; K/P-6688; CONF-820835-1) Avail: NTIS HC A02/MF A01

A valuable tool of peventive maintenance in electrical systems is the use of infrared surveys. Infrared scanners detect problems which produce an abnormal rise in temperature. Because electrical equipment is scanned while it is in service, actual operating conditions are observed. The ability to determine the amount of temperature rise is important in establishing priorities for maintenance work. Parameters which affect the accuracy of infrared scanners are discussed. DOE

N83-28336# Los Alamos Scientific Lab., N. Mex.
ULTRAFAST GATING OF PROXIMITY-FOCUSED MICROCHANNEL-PLATE INTENSIFIERS
A. S. Lundy and A. E. Iverson 1982 13 p refs Presented at 26th Tech. Symp. and Exhibition of the Intern. Soc. for Opt. Engr., San Diego, Calif., 21 Aug. 1982
(Contract W-7405-eng-36)
(DE82-019577; LA-UR-82-1830; CONF-820822-5) Avail: NTIS HC A02/MF A01

Proximity focused, microchannel plate (MCP) image intensifers were used at Los Alamos for many years to allow single frame film and video exposure times in the range of 2.5 to 10 ns. A program to reduce gating times to < 1 ns is in existence. Previous work and the problems in achieving good resolution with gating times of < 1 ns are reviewed. The key problems involve applying fast electrical gating signals to the tube elements. Computer modeling studies of the combined tube, tube connection, and pulser system are presented and show that low photocathode surface resistivity must be obtained to permit fast gating between the photocathode and the MCP input. Ways of making low resistivity S20 photocathodes, using gallium arsenide photocathodes, and various means of gating the tubes were discussed. A variety of pulser designs are experimentally evaluated including spark gaps, avalanche transistors, Kryton tubes with sharpening gaps, step recovery diodes, and photoconductive elements. DOE

N83-28337# General Electric Co., St. Petersburg, Fla. Neutron Generator Development Engineering Operation.
FIELD SHAPING TO IMPROVE VACUUM-DIODE VOLTAGE HOLDOFF
E. J. Furno and R. E. Shafer 15 Feb. 1983 19 p refs
(Contract DE-AC04-76DP-00656)
(DE83-008123; GEPP-TIS-667a) Avail: NTIS HC A02/MF A01

The overall holdoff voltage for a diode with fixed insulator and interelectrode gap length is affected by the position of the interelectrode gap. Experiments were made with two sizes of diodes, varying the location of the interelectrode space from the negative end to the positive end. The large diode high voltage holdoff ranged from 240 kV with the interelectrode space at the negative end to 180 kV with the interelectrode space at the negative end to 180 kV with the interelectrode space in the middle of the insulator. The smaller diode high voltage holdoff ranged from a high of 200 kV with the interelectrode space at the negative end to 130 kV with the interelectrode space at the positive end. Since most of the high voltage breakdowns were across the insulator, electron avalanching was suspected. Computer generated field plots confirmed this possibility. With the interelectrode space at the negative end, the field lines direct any field emission electrons from the triple junction or the edge of the negative electrode away from the glass. All other configurations direct the electrons toward the glass. DOE

N83-28338# Oak Ridge National Lab., Tenn.
HIGH-VOLTAGE-GRADIENT ZINC OXIDE VARISTORS: FABRICATION AND PROPERTIES
R. J. Lauf Mar. 1983 22 p refs
(Contract W-7405-eng-26)
(DE83-008137; ORNL/TM-8484) Avail: NTIS HC A02/MF A01

Zinc oxide varistors have many properties that make them attractive as surge arrestors or voltage limiters in high-voltage power transmission systems. The electrical characteristics are influenced by the ZnO grain size, and reducing the grain size would allow the entire device to be much smaller. The practical advantages of smaller arristors are particularly important for underground transmission lines. Advanced ceramic processing techniques were used to fabricate ZnO varistors having grain sizes in the 3- to 4-(SIGMA)m range, compared to 7 to 13 (SIGMA) m in commercial devices. The fin-grained varistors exhibited high breakdown voltage gradients, compared to commercial materials. Processing steps included synthesis of highly active powders by sol-gel techniques and hot pressing in a reducing environment to achieve high density at temperatures below about 8000 C. Heat treatment in air at temperatures up to 10000 C fully developed the nonohmic electrical properties. DOE

N83-28339# Oak Ridge National Lab., Tenn. Energy Div.
ADVANCED POWER-CONVERSION CONCEPTS FOR HVDC TRANSMISSION SYSTEMS
Ward T. Jewell Jan. 1983 33 p refs
(Contract W-7405-eng-26)
(DE83-008141; ORNL-5898) Avail: NTIS HC A03/MF A01

Increasing complexity of high voltage direct current (HVDC) transmission systems places new demands on alternating current/direct current (ac/dc) power converters. The possibility of using advanced power conversion techniques, specifically force commutated conversion, is discussed. Recommended further work includes computer simulation studies, a survey of the future availability of solid state switching devices, a review of advanced converter designs, and finally, the actual design of an HVDC converter that uses advanced conversion concepts. DOE

N83-28340# California Univ., Livermore. Lawrence Livermore Lab.
USING A MICROPROCESSOR TO CALIBRATE AND CORRECT CHARGE-COUPLED DEVICES
C. F. McConaghy and G. C. Tyler 4 Nov. 1982 15 p refs
(Contract W-7405-eng-48)
(DE83-007153; UCRL-53355) Avail: NTIS HC A02/MF A01

The serial parallel serial charge coupled device which is used to record fast transients is discussed. The chip introduces a number of noise sources and signal transformations. A postcalibration technique was used to calibrate out some of the fixed noise sources and to restore the CCD output data to its original input form. The postcalibration technique uses and LSI-11/23 and a CAMAC analog to digital and digital to analog converter. DOE

N83-28341# Oak Ridge National Lab., Tenn. Engineering Technology Div.
ELECTRICAL IMPEDANCE STRING PROBES FOR TWO-PHASE VOID AND VELOCITY MEASUREMENTS
J. E. Hardy and J. O. Hylton May 1982 90 p refs
(Contract W-7405-eng-26)
(DE82-015153; NUREG/CR-2505; ORNL/TM-8172) Avail: NTIS HC A05/MF A01

An instrumentation scheme was developed to measure two phase flow velocity and void fraction during the refill/reflood stages of a loss of coolant accident in experimental test facilities. The instrumentation's principle of operation was based on measurement of the electrical impedance of two phase mixtures. Two phase velocity is estimated by time of flight analysis of signals from two spatially separate sensors. A relative capacitive technique was employed to measure void fraction. The impedance sensor consists of a pair of stainless steel wires strung back and forth across a stainless steel frame. This sensor was dubbed string probe for this reason. The string probe was designed to withstand temperatures of 350 C, thermal transients of approximately 300 C/s, and severe fluid and condensation induced shocks. DOE

N83-28342# Duro-Test Corp., North Bergen, N.J.
ENERGY-EFFICIENT INCANDESCENT LAMP Final Report, 16 Dec. 1980 - 30 Nov. 1981
Apr. 1982 20 p refs Prepared in cooperation with Lawrence Berkeley Lab.
(Contract DE-AC03-76SF-00098)
(DE82-018915; LBL-14546; EEB-L-82-06; L-65) Avail: NTIS HC A02/MF A01

The status of the Energy Efficient Light Bulb (EELB) development at the beginning of the subcontract was characterized by a newly introduced lamp construction based on an optimum optical quality envelope consisting of two hemispheres or hemi-ellipsoids bonded together. Considerable progress was made concerning the output of the continuous process heat mirror coating machine, the reproducibility of the film characteristics, and the durability of the coating over long periods of lamp operation. The bonding assembly processes were improved to the point where they are suitable for full mechanization and high speed production. A new concept for dimensioning the required compact and mechanically stable filaments was introduced by using diodes in series that reduce the effective operating voltage to 83 volts. This led to filament designs of greater stability and greater compactness than any obtained before. DOE

N83-28343# Oak Ridge National Lab., Tenn. Atomic, Molecular, and High Voltage Physics Group.
GASEOUS-DIELECTRICS RESEARCH AND APPLICATIONS Semiannual Report, 1 Oct. 1981 - 31 Mar. 1982
L. G. Christophorou, D. R. James, R. A. Mathis, I. Sauers, S. R. Hunter, M. O. Pace, D. W. Bouldin, S. M. Spyrou, A. Fatheddin, and V. K. Lakdawala Jul. 1982 148 p refs
(Contract W-7405-eng-26)
(DE82-018574; ORNL/TM-8368) Avail: NTIS HC A07/MF A01

The principal mission of this program continues to be the study of basic physics and mechanisms of gaseous dielectrics and the systematic use of this knowledge to develop improved gaseous dielectrics tailored to all practical needs. The program comprehensively addresses all the basic and applied aspects of gaseous dielectrics research and applications. Current areas of thrust include: improving overall characteristics of binary and ternary dielectric mixtures through increased knowledge of fundamental physics and testing in practical contamination; study of practical problems of applying improved dielectrics, such as economics, availability, dew points, heat transfer, particle control, and gas handling; and study of decomposition of stressed gas dielectrics and the implications for toxicity, corona detection, and long-term reliability. In addition to power apparatus applications, the area of gaseous dielectrics tailored for pulsed power applications has begun to receive attention in the program. DOE

N83-28344# California Univ., Livermore. Lawrence Livermore Lab.
ALKALI METAL ACID PHOSPHATES FOR USE AS ELECTROLYTES IN THE ELECTROLYSIS OF WATER AT ELEVATED TEMPERATURES
Pamela K. Shell, Oscar H. Krikorian, and Margaret M. Steinbugler 1982 11 p refs Presented at the World Hydrogen Energy Conf., Pasadena, Calif., 13 Jun. 1982
(Contract W-7405-eng-48)
(DE82-008239; UCRL-87273; CONF-820605-10) Avail: NTIS HC A02/MF A01

The use of molten salts containing water is electrolytes for the high temperature (approximately 700 K) electrolysis of water is explored. The electrolysis behavior of partially neutralized phosphate-based electrolytes, such as MH5(PO4)2, where M represents an alkali metal cation is determined. The main interest is in the characteristics of these molten salts as a function of neutralizing cation, water content, and temperature. The behavior of these molten salts was observed using platinum electrodes while measuring cell potential as a function of time at constant current densities up to 1 A/sq cm. Cell resistance before and after polarization was monitored in order to correlate electrode conductivity with the degree of dehydration. The most obvious characteristic of these melts is their tendency to continuously dehydrate at elevated temperatures when in an open container. This loss of water increases the potential for any given current and temperature, primarily by increasing the resistance of the electrolyte. DOE

N83-28345# Midwest Research Inst., Golden, Colo. Building Systems Research Branch.
ANALYSIS OF ON-SITE USE AND SELLBACK IN RESIDENTIAL PHOTOVOLTAIC SYSTEMS
Sanford Sillman Apr. 1982 64 p refs
(Contracts DE-AC02-77CH-00178; EG-77-C-01-4042)
(DE82-012697; SERI/TR-254-1444) Avail: NTIS HC A04/MF A01

One promising early use of photovoltaics is grid connected residential systems without batteries. In these systems, photovoltaic power is used onsite as much as possible, and the remainder is sold back to the utility. The amount of direct on-site use versus sellback of photovoltaic power depends on the instantaneous load patterns. A method is developed for characterizing the in-

stantaneous load based on the on/off probabilities of individual appliances. A monthly step simulation method based on the instantaneous load characterization is presented and verified. Simulations are performed for several residential load mixes, including the use of energy efficient appliances and passive solar design. Results show that on-site use of photovoltaic power is much less, and sellback much more, than previous results indicated for single family residences. Even small systems are found to sell back 50% or more of generated power to the utility. DOE

N83-28346# Knolls Atomic Power Lab., Schenectady, N. Y.
APPLICATION OF ALTERNATING CURRENT IMPEDANCE MEASUREMENTS TO CHARACTERIZE ZIRCONIUM ALLOY OXIDATION FILMS
P. M. Rosecrans Jun. 1982 33 p refs Presented at 6th Intern. Conf. on Zirconium in the Nucl. Indus., Vancouver, British Columbia, 28 Jun. 1982
(Contract DE-AC12-76SN-00052)
(DE82-018769; KAPL-4149; CONF-820662-2) Avail: NTIS HC A03/MF A01

In an effort to understand observed differences in high temperature steam corrosion resistance, high frequency (>500 Hz) a-c impedance measurements were used to monitor the permeability of oxidation films formed on Zircaloy 2 and Zircaloy 4 samples exposed to high temperature steam. Differences in oxidation resistance are related to differences in oxidation film permeability and ultimately to film characteristics. When these results are added to the existing data base established for zirconium alloy oxidation films using the high frequency impedance technique, improved understanding of the role of bulk corrodent access to the metal-oxide interface during oxidation becomes possible. In addition, differences in film character resulting from differences in oxidation environment become apparent upon review of the existing data base. Such differences may have practical application in selecting material preconditioning procedures and suggest explanations for some oxide film memory effects reported in the literature. DOE

N83-28347# Department of Energy, Washington, D. C. Office of Emergency Operations.
THE 300-kV INTERNATIONAL SUBMARINE TRANSMISSION LINE: ERIE, PENNSYLVANIA TO NANTICOKE, ONTARIO, CANADA, GENERAL PUBLIC UTILITIES CORPORATION
May 1982 169 p refs
(DE82-015478; DOE/EIS-0079-Final) Avail: NTIS HC A08/MF A01

This final environmental impact statement (FEIS) was prepared by the Office of Energy Emergency Operations. The proposed action by the Department of Energy is the granting of a Presidential Permit for the construction, connection, operation, and maintenance of 69.6 kilometers (44 miles) of a +250 to +325 and -250 to -325 kilovolt (250 to 325 kV) transmission facility from the Erie West Substation to the international border. The proposed project will connect the General Public Utilities Corporation System with the Ontario Hydro System for the purpose of economic exchanges of power and increased reliability. Environmental impacts expected from construction and operation of the proposed Lake Erie Interconnection appear to be mainly transitory effects on aquatic life due to construction. DOE

N83-28348# Los Alamos Scientific Lab., N. Mex.
IMAGE SHUTTERS: GATED PROXIMITY-FOCUSED MICROCHANNEL PLATE (MCP) WAFER TUBES VERSUS GATED SILICON INTENSIFIED TARGET (SIT) VIDICONS
G. J. Yates, N. S. P. King, S. A. Jaramillo, J. W. Ogle, B. W. Noel, and N. N. Thayer 1982 11 p refs Presented at the SPIE Conf., San Diego, Calif., 21-27 Aug. 1982
(Contract W-7405-eng-36)
(DE82-018452; LA-UR-82-1749; CONF-820822-2) Avail: NTIS HC A02/MF A01

Response data, including gating speed, gain, dynamic range, shuttering efficiency, and resolution for 18- and 25-mm-diam proximity-focused microchannel-plate (MCP) intensifiers are compared with similar data for a prototype electrostatically-focused 25-mm-diam gated silicon-intensified-target (SIT) vidicon. Conductive substrate material and thickness used to reduce photocathode resistivity, spacing between gating electrodes to minimize interelectrode capacitance, the use of conductive grids on the photocathode substrate to permit rapid propagation of the electrical gate pulse to all areas of the photocathode, and different package geometries to provide a more effective interface with external biasing and gating circuitry were varied in both tube types to determine optimal performance from each design. For comparable spatial resolution, most 18-mm-diam MCPs require gate times > 2.5 ns while the fastest SIT has demonstrated sub-nanosecond optical gates as short as approximately 400 + or - 50 ps for full shuttering of the 25-mm-diam input window. DOE

N83-28349# Sandia Labs., Albuquerque, N. Mex. Computer-Aided Design Div.
INTERACTIVE LOGIC SIMULATION
John M. Acken 1982 28 p refs Presented at the 19th Design Automation Conf., Las Vegas, Nev., 14 Jun. 1982
(Contract DE-AC04-76DP-00789)
(DE82-006301; SAND-81-2537C; CONF-820602-2) Avail: NTIS HC A03/MF A01

Interactive computing techniques allow maximum utilization of the interface between users and machines. Interactive procedures for generating input and inspecting results for Logic simulation must be supplemented by access to the analysis portion during simulation to allow truly interactive Logic simulation. The logic Simulator (SALOGS) has implemented interactive simulation. DOE

N83-28350# Los Alamos Scientific Lab., N. Mex.
SWITCHING TESTS FOR THE LCTF PROTECTIVE DUMP CIRCUIT
W. M. Parsons Apr. 1982 42 p refs
(Contract W-7405-eng-36)
(DE82-015073; LA-9261-MS) Avail: NTIS HC A03/MF A01

Each of the six coils in the Large Coil Test Facility (LCTF) has a separate power supply, dump resistor, and switching circuit. Each switching circuit contains five switches, two of which are redundant. The three remaining switches perform separate duties in an emergency dump situation. These three switches were tested to determine their ability to meet the LCTF conditions. DOE

N83-28351# Los Alamos Scientific Lab., N. Mex.
DYNAMO THEORY: CAN AMPLIFICATION OF MAGNETIC-FIELD PROFILES ARISE FROM A CROSS-FIELD ALPHA EFFECT
Richard Gerwin and Rhon Keinigs Apr. 1982 8 p refs
(Contract W-7405-eng-36)
(DE82-013739; LA-9290-MS) Avail: NTIS HC A02/MF A01

Amplification of magnetic field profiles through cross field alpha effects was investigated. Cylindrical geometry for an essentially arbitrary radial dependence of the alpha effect provides the answer, except that it is subject to a simple, physically required constraint. The interest in this type of alpha effect derives from its connection with compressible turbulence, which is usually not considered in kinematic dynamo theory. DOE

N83-28352# California Univ., Livermore. Lawrence Livermore Lab.
SPACE-CHARGE PERTURBATION EFFECTS IN PHOTONIC TUBES UNDER HIGH IRRADIATION
R. Kaligjian and G. G. Peterson Jun. 1982 17 p refs Presented at the 15th Intern. Congr. on High Speed Phot. and Photonics, San Diego, Calif., 21 Aug. 1982
(Contract W-7405-eng-48)
(DE82-018395; UCRL-86929; CONF-820824-6) Avail: NTIS HC A02/MF A01

Potential perturbation effects at the cathode region of a photonic tube can occur at high intensity due to space charge. using appropriate photoelectron energy distribution functions, the electric field at the cathode is calculated and its effect upon the spatial/temporal resolution is examined. DOE

N83-28353# California Univ., Livermore. Lawrence Livermore Lab.
TESTS OF A LOW-PRESSURE SWITCH PROTECTED BY A SATURATING INDUCTOR
E. J. Lauer and D. L. Birx 1982 7 p refs Presented at the 15th Power Modulator Symp., Baltimore, 14 Jun. 1982
(Contracts W-7405-eng-48; N61921-82-WR-W1156; DARPA Order 4395)
(DE82-016587; UCRL-87266; CONF-820626-4) Avail: NTIS HC A02/MF A01

Low pressure switches and magnetic switches were tested as possible replacements for the high pressure switches currently used on Experimental Test Accelerator and Advanced Test Accelerator. When the low pressure switch is used with a low impedance transmission line, runaway electrons form a pinched electron beam which damages the anode. The use of the low pressure switch as the first switch in the pulsed power chain was tested; i.e., the switch would be used to connect a charged capacitor across the primary winding of a step up transformer. An inductor with a saturating core is connected in series so that, initially, there is a large inductive voltage drop. As a result, there is small voltage across the switch. By the time the inductor core saturates, the switch has developed sufficient ionization so that the switch voltage remains small, even with peak current, and an electron beam is not produced. DOE

N83-28354# European Space Agency, Paris (France).
EVALUATION OF TEMPERATURES ATTAINED BY ELECTRONIC COMPONENTS DURING VARIOUS MANUAL SOLDERING OPERATIONS
B. D. Dunn (ESTEC, Noordwijk, Netherlands), G. Hilbrands (Christian Rovsing A/S, Ballerup, Denmark), and P. J. Nielsen (Christian Rovsing A/S, Ballerup, Denmark) Mar. 1983 48 p refs
(ESA-STM-230; ISSN-0379-4075) Avail: NTIS HC A03/MF A01

After component-failure analyses showed that defective spacecraft devices were overheated during soldering, it was verified that quality-assurance personnel omitted to control pretinning-bath and soldering iron temperatures, so data were acquired under controlled processing conditions. Component temperature rises were recorded during degolding, pretinning, soldering and the reworking of soldered joints. Results show that existing ESA specifications for manual soldering and repair ensure that the maximum temperature ratings ascribed to standard spacecraft components are not exceeded. Application of heat sinks to certain delicate components during degolding is essential, and it can be advantageous to apply them during pretinning and other soldering operations. Author (ESA)

N83-28355# National Science Foundation, Washington, D.C. Div. of Electrical, Computer and Systems Engineering.
DIGITAL SIGNAL PROCESSING. REPORT OF THE MEETING OF NSF SUPPORTED PRINCIPAL INVESTIGATORS
1982 154 p refs Meeting held in Washington, D.C., 21-22 Jun. 1982
(PB83-145078; NSF/ECS-82005) Avail: NTIS HC A08/MF A01 CSCL 09E

Research efforts in six areas are summarized: (1) structures for digital signal processing; (2) (VLSI) in digital signal processing; (3) adaptive digital filtering; (4) multidimensional processing and spectral analysis; (5) two dimensional signal processing and image processing; and (6) compression and speech processing. Research directions and trends in signal processing are discussed. New digital signal processing applications are identified, including communications, consumer electronics, medicine, automated manufacturing, and aids fo the handicapped. The increasing importance of addressing algorithmic issues in close collaboration with applications is emphasized and the need for new metrics for evaluating signal processing is noted. GRA

N83-28029*# Jet Propulsion Lab., California Inst. of Tech., Pasadena. Communications Systems Research Sect.
APPROXIMATION TO THE PROBABILITY DENSITY AT THE OUTPUT OF A PHOTMULTIPLIER TUBE
R. J. Stokey and P. J. Lee *In its* The Telecommun. and Data Acquisition Rept. 15 May 1983 p 36-39 refs (For primary document see N83-28025 17-12)
Avail: NTIS HC A09/MF A01 CSCL 09A

34 FLUID MECHANICS AND HEAT TRANSFER

Includes boundary layers; hydrodynamics; fluidics; mass transfer; and ablation cooling.

For related information see also *02 Aerodynamics* and *77 Thermodynamics and Statistical Physics.*

N83-28356* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
AUTOMATIC THERMAL SWITCH Patent
Joseph W. Cunningham and Lawrence D. Wing, inventors (to NASA) Issued 21 Jun. 1983 10 p Filed 21 Dec. 1979 Supersedes N80-21671 (18 - 12, p 1572)
(NASA-Case-GSC-12553-1; US-Patent-4,388,965; US-Patent-Appl-SN-106192; US-Patent-Class-165-32; US-Patent-Class-165-76; US-Patent-Class-165-185) Avail: US Patent and Trademark Office CSCL 20D

An automatic thermal switch to control heat flow includes two thermally conductive plates and a thermally conductive switch saddle pivotally mounted to the first plate. A flexible heat carrier is connected between the switch saddle and the second plate. A phase-change power unit, including a piston coupled to the switch saddle, is in thermal contact with the first thermally conductive plate. A biasing element biases the switch saddle in a predetermined position with respect to the first plate. When the phase-change power unit is actuated by an increase in heat transmitted through the first place, the piston extends and causes the switch saddle to pivot, thereby varying the thermal conduction between the two plates through the switch saddle and flexible heat carrier. The biasing element, switch saddle, and piston can be arranged to provide either a normally closed or normally opened thermally conductive path between the two plates.
Official Gazette of the U.S. Patent and Trademark Office

N83-28357 Michigan Univ., Ann Arbor.
FLOW PHENOMENA AND BUBBLE BEHAVIOR IN ROTATING DISC CONTACTORS Ph.D. Thesis
Jong-Huai Wang 1982 275 p
Avail: Univ. Microfilms Order No. DA8225066

A numerical model for predicting the flow phenomena, power requirements, and bubble behavior in rotating disc contactors (RDCs) is presented. The problem is formulated and the governing Navier-Stokes equations are transformed into stream function, velocity and tangential velocity equations. Integrations are taken around a control volume in the flow field, and the above equations are reduced to a set of simultaneous, algebraic, finite difference equations. A fast-converging, line-iteration technique is then used to solve these difference equations. Both laminar and turbulent flows were considered. The trajectory of a single gas bubble moving the RDCs with or without mass transfer was obtained by solving simultaneously the bubble radius-time history and kinetic equations. A three-stage, perforated RDC system with alpha = 45 deg was set up, and a flow visualization technique using aluminum powder as tracer particles was employed to study the flow patterns in the system. The velocity distribution was determined by analyzing the streaklines of aluminum particles on time-exposure photographs. In the flow ranges observed, the experimental data agree qualitatively with the numerical predictions. Dissert. Abstr.

N83-28358 Northwestern Univ., Evanston, Ill.
INTERPHASE TRANSPORT IN HORIZONTAL STRATIFIED COCURRENT FLOW Ph.D. Thesis
Robert James Jensen 1982 201 p
Avail: Univ. Microfilms Order No. DA8225944

The problem of interfacial transport is cocurrent, horizontal stratified gas-liquid systems is considered. Local condensation heat transfer coefficients and interface shear stress were obtained from mass and force balances. These balances were based on gas phase pitot traverses at various streamwise locations. Laser anemometer measurements of liquid mean and rms fluctuation velocities were made at similar locations. Based on cocurrent stratified air-water flow data the noncondensing interface shear stress was found to be a functhe relative velocity between the phases and the liquid fraction. Incorporated into Linehan's relation for condensing flow shear stress, the correlation was found to estimate the shear velocity for the condensation data considered. Local condensation heat transfer coefficients and gas absorption mass transfer coefficients were found to be directly proportional to the shear velocity. The correlations for interfacial shear stress and scalar transport can be combined to yield an interactive technique suitable for an engineering analysis of the interface heat, mass, and momentum transfer in a single driving force cocurrent system. Dissert. Abstr.

N83-28359 Florida Univ., Gainesville.
INVESTIGATION OF A LOW HEAT LOSS HIGH TEMPERATURE THERMAL ENERGY STORAGE SYSTEM Ph.D. Thesis
Norman Alan Cope 1982 163 p
Avail: Univ. Microfilms Order No. DA8226380

A low heat loss thermal energy storage system capable of storage in a range of 250-100 F is described. The design criteria called for a storage system that is simple to construct, uses inexpensive and readily available materials, utilizes an insulating material with a thermal conductivity between 0.003 - 0.015 Btu/hrft F for temperatures ranging between 250-100 F, and be suitable for residential or commercial applications. A design selected to fulfill the above criteria consists of a double tank wherein the annular space between the tanks is filled with a porous powder (silica) and then evacuated to a pressure of approximately 1 mm Hg. Thermal conductivity values of 0.0029 - 0.1100 Btu/hrft F were achieved experimentally for vacuum levels ranging from 0.5 - 3.0 mm Hg and hot surface temperatures ranging from 340 - 711 F. Dissert. Abstr.

N83-28360 Purdue Univ., Lafayette, Ind.
CONVECTIVE HEAT TRANSFER IN LOUVERED SOLAR COLLECTORS Ph.D. Thesis
David Michael Christopher 1982 219 p
Avail: Univ. Microfilms Order No. DA8225698

A family of air-heating solar collectors having a louvered absorber-convector was analyzed experimentally and theoretically for normal ranges of design and operating conditions. The first theoretical model is based on an algebraic formulation of the conversion equations. It accounts for conduction, convection, and thermal and solar band radiation exchange. The second theoretical model is a differential formulation and numerical solution of the two dimensional conservation equations. The analysis includes variable properties, buoyancy, and radiative uransfer between surfaces. The multiply-connected computational region lies between the lower cover plate and the backplate and contains the absorber, which is made of overlapping, opaque louvers. The experimental and differential models are used to determine the convective heat transfer coefficient along the louver surfaces. The thermal efficiency of the louvered collector is determined from the experimental results and from the algebraic model. Parametric studies are performed to determine the effects that collector and louver geometry and several operating parameters have on the louver Nusselt number and the collector thermal efficiency. Dissert. Abstr.

N83-28361 Purdue Univ., Lafayette, Ind.
HYDRODYNAMIC AND THERMAL EFFECTS IN MOVING WATER LAYERS UNIFORMLY HEATED FROM BELOW Ph.D. Thesis
Gann-Shyong Wang 1982 223 p
Avail: Univ. Microfilms Order No. DA8225782

Convective heat transfer processes in a water layer flowing over a heated heated plate and the effects of buoyancy on hydrodynamic and thermal conditions in the water were studied. The experimental apparatus consisted of a water channel with a test section that was uniformly heated from below. Three different means of flow visualization were used and included the hydrogen bubble, dye injection and shadowgraph techniques. The results indicate that buoyancy forces induced by heating from below will disturb the flow to the point of hastening the occurrence of transition from laminar to turbulent conditions, and will enhance mixing in the turbulent flow regime. For a given flow condition, these effects increase with increasing bottom heat flux; for a given heat flux, the effects increase with decreasing mean flow velocity. Convective heat transfer coefficients were also inferred from temperature measurements, and the results indicate that heat transfer is significantly enhanced by the effects of buoyancy. Dissert. Abstr.

N83-28362 Oregon State Univ., Corvallis.
A FREE BOUNDARY VALUE PROBLEM FOR THE GAS DYNAMIC EQUATIONS Ph.D. Thesis
Jurgen Gerlach 1983 79 p
Avail: Univ. Microfilms Order No. DA8226254

A mathematical model arising from the following physical situation is discussed. A gas-filled cylinder with a piston at one end whose motion is determined by the pressure of the gas within the cylindaer and by external forces is considered. Zero mass flux is assumed at the piston while the mass flux is known at the fixed end. This model leads to a free boundary value problem in volving the gas dynamic equations. Existence and uniqueness theorems are presented for the linearized problem anf for a special case of the nonlinear problem. In the nonlinear case, the interaction between shocks and the motion of the free boundary are studied. Finally, numerical algorithms for finding approximate solutions of the linear and nonlinear models are suggested and examples are performed. Dissert. Abstr.

N83-28363 California Univ., San Diego, La Jolla.
NEAR CRITICAL FREE SURFACE FLOW PAST AN OBSTACLE Ph.D. Thesis
Susan Lou Epps 1982 97 p
Avail: Univ. Microfilms Order No. DA825580

The problem of inviscid, irrotational, incompressible, free surface flow over a small bump is considered. The important nondimensional parameter is the Froude number, F. The solution to the two dimensional linearized problem is given exactly. Free surface waves exist downstream of the bump for $F < 1$ only. Their wavelength increases as F tends to 1- predicting a free surface which intersects the bottom for F near 1-. The flow for $F > 1$ is symmetric with respect to a symmetric bump (thus producing no drag) and predicts a free surface which tends to infinity as F tends to $1+$. Second order theory is used to indicate the range of validity of the linear approximation with respect to the parameter F. A nonlinear solution is required to link together the linear flow solutions through $F = 1$. Some progress is made toward understanding the nonlinear solution. Flows near $F = 1+$ appear to rise along a solitary wave and pass over the bump with a local Froude number less than 1. In this way, their solution is joined continuously with the solution for $F = 1-$ and a positive drag is obtained for all F near 1. The solution to the three dimensional linearized problem is also given exactly. Dissert. Abstr.

N83-28364 Case Western Reserve Univ., Cleveland, Ohio.
PREDICTION OF NATURAL CONVECTION FLOW PATTERN IN LOW-ASPECT RATIO ENCLOSURES Ph.D. Thesis
Jinho Lee 1982 134 p
Avail: Univ. Microfilms Order No. DA8224690

The natural convection of a fluid confined within a low aspect ratio rectangular enclosure with differentially heated end walls is addressed. The objective is to predict the core flow pattern a priori once the boundary and geometry conditions are given. Multiple scales technique is employed to obtain a proper mathematical model from which the core flow patterns are analyzed based on various force balances. Global analyses show a number of possible core configurations. Detailed analyses lead to predictions for the occurrence of possible flow subregimes, such as secondary

cells. Comparison with the existing experimental results shows good agreement. Dissert. Abstr.

N83-28365 Case Western Reserve Univ., Cleveland, Ohio.
EXPERIMENTAL STUDY OF THE EFFECTS OF SURFACE ROUGHNESS ON LAMINAR BOUNDARY LAYER STABILITY IN WATER Ph.D. Thesis
Hyoun-Woo Shin 1982 211 p
Avail: Univ. Microfilms Order No. DA8224703

Experimentally measured stability characteristics are presented for a laminar boundary layer developing in water over a flat plate with both smooth and rough surfaces. Three different grades of sandpaper are used to provide different levels of distributed roughness. The experiment is performed in the CWRU low turbulence water tunnel with free stream turbulence intensities of 0.1% to 0.2%. Linear sinusoidal disturbances are introduced into the boundary layer using a vibrating ribbon. The mean flow measurements indicate Blasius profiles for the finest roughness tested. With coarser roughness, the profile is best approximated by a Blasius profile up to Re(x) = 120,000 but then progresses toward a turbulent profile. The coarsest roughness triggers transition under all test conditions. Neutral stability and disturbance growth rate characteristics measured for the finest roughness indicate only very minor departures from the results for a smooth surface. For the coarser roughness case, disturbance growth is greatest at frequencies below the Tollmien-Schlichting band. Results of detailed measurements of mean velocity, disturbance velocities and spectra are presented and analyzed. Dissert. Abstr.

N83-28366 California Univ., Davis.
A NUMERICAL STUDY OF TURBULENT FLOWS IN BACKWARD-FACING STEP GEOMETRIES: A COMPARISON OF 4 MODELS OF TURBULENCE Ph.D. Thesis
Munir Mehmet Suat Sindir 1982 636 p
Avail: Univ. Microfilms Order No. DA8227890

A numerical study of two dimensional separating and reattaching turbulent flows in plane backward facing step geometries with parallel and deflected walls. Closure of the Reynolds equations was achieved by four different models: kappa-epsilon modified kappa-epsilon algebraic streess and modified algebraic stress models. The kappa-epsilon model relates the Reynolds stresses to the mean rate of strain through the definition of an isotropic turbulent viscosity, whereas the more advanced algebraic stress model calculates the stresses from implicit algebraic relationships containing the stresses themselves, the mean rate of strain, and the turbulent kinetic energy and its dissipation rate. Modified versions of the models employ a new dissipation rate equation whose production term was made more sensitive to streamwise curvature effects. A new non-equilibrium wall function treatment was also incorporated into each model. Dissert. Abstr.

N83-28367 Minnesota Univ., Minneapolis.
THE MEASUREMENT OF 2 TURBULENT FLUID FLOWS WITH TEMPERATURE FLUCTUATION USING LASER-DOPPLER TECHNIQUE Ph.D. Thesis
Kei Yun Lau 1982 305 p
Avail: Univ. Microfilms Order No. DA8221300

The measurement of turbulence in two flow fields with temperature fluctuation was examined: the natural convection flow between two horizontal boundaries and the exhaust flow from a jet engine combustor. Laser Doppler velocimeters with dual Bragg cells were developed for the measurements. A phase lock demodulator was used with on-line computer to obtain time domain data for the natural convection flow. A high speed digital counter was employed to acquire velocity and turbulent intensity data for the combustor flow. Convection experiments were carried out in a deep horizontal layer of water heated from below and cooled from above with well insulated side wall. The range of Rayleigh number ws from 10E9 to 10E12. Heat flux measurements correlated well with previous experimental data even with small width to height aspect ratios from 0.3 to 1. Power spectra of both the vertical and horizontal velocities showed that the turbulence is random even at the smallest aspect ratio measured. Dissert. Abstr.

N83-28368 West Virginia Univ., Morgantown.
HEAT TRANSFER IN HORIZONTAL TUBES IMMERSED IN FLUIDIZED BEDS Ph.D. Thesis
Clement Ijeh Anekwe 1982 199 p
Avail: Univ. Microfilms Order No. DA8226915

A theoretical model is proposed, and experimental data presented and analyzed, for the overall convective heat transfer coefficient at ambient conditions between horizontally immersed tubes and a gas fluidized bed of particle sizes usually applicable in fluidized bed combustion of coal. The overall heat transfer coefficient is a function of gas and particle heat transfer coefficients. The bubbling flow assumption, together with the two phase theory of fluidization, is used to obtain a simple analytical solution for the particle convective heat transfer coefficient. The equation for gas convective heat transfer coefficient is obtained through an analogy with heat transfer in packed beds. To a first order approximation the particle and gas convective components are additive. Dissert. Abstr.

N83-28369# British Library Lending Div., Boston Spa (England).
MODELLING THE HEATING OF OXIDIZING MASSIVE BODIES BY THE METHOD OF NETWORKS WITH MOVABLE NODES
V. I. Panferov and B. N. Parsunkin 14 Apr. 1983 8 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Chernaya Met. (USSR), 1982 p 105-109
(BLL-M-26972-(5828.4)) Avail: British Library Lending Div., Boston Spa, Engl.

A finite-difference model of the heating of massive bodies is presented which allows for the influence of a scale layer on heat transfer. An example of the calculation is given and some results obtained with the model are discussed. Author

N83-28370# British Library Lending Div., Boston Spa (England).
CALCULATION FORMULA FOR EXPERIMENTAL DETERMINATION OF TEMPERATURE-DEPENDENT COEFFICIENT OF THERMAL CONDUCTIVITY
Yu. S. Postolnik and V. M. Manko 14 Apr. 1983 8 p refs Transl. into ENGLISH from Izv. (USSR), 1982 p 109-112
(BLL-M-26971-(5828.4)) Avail: British Library Lending Div., Boston Spa, Engl.

The problem of calculations for the experimental determination of temperature-dependent thermal conductivity is considered and the usefulness of the equivalent-source method is indicated. Formulas proposed for determining the coefficients of the quadratic polynomial by which the thermal conductivity is represented are derived on the assumption that the heat flux to the specimen is a set function of time. An example worked out for a plate is presented. Author

N83-28371# British Library Lending Div., Boston Spa (England).
CALCULATION OF TURBULENT CONVECTIVE HEAT EXCHANGE IN A CYLINDRICAL CHANNEL WITH A SUDDEN EXPANSION
L. N. Toritsyn, E. R. Cheshchevik, and V. L. Sovetkin 14 Apr. 1983 6 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Chernaya Met. (USSR), v. 4, 1982 p 116-119
(BLL-M-26973-(5828.4)) Avail: British Library Lending Div., Boston Spa, Engl.

On the basis of analyses of experimental data, formulae are recommended for the calculation of heat exchange in a channel with a sudden expansion when a stabilized or uniform stream of gas or liquid is flowing in the connecting pipe. Other formulae are recommended for the case where there are burner arrangements in the inlet connecting pipe that disturb the uniformity of the velocities field. S.L.

N83-28372# British Library Lending Div., Boston Spa (England).
A METHOD OF EXPERIMENTAL INVESTIGATION OF THE KINEMATICS OF PLASTIC FLOW
G. Ya. Gun, S. A. Stebunov, and V. M. Tvere 1982 3 p Transl.

into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Chernaya Met. (USSR), v. 3, 1982 p 151-152
(BLL-M-26941-(5828.4)) Avail: British Library Lending Div., Boston Spa, Engl.

A method based on spline theory with flowlines as starting information was utilized to investigate plastic flow kinetics, and the results of an experimental investigation of the distribution of kinematic parameters in the rolling of a Pb-3%Sb alloy are presented as an example. Author

N83-28373 California Univ., Davis.
NUMERICAL SOLUTION TO THE STOKES EQUATIONS FOR FLOW PAST 2 SPHERES AND A CHAIN OF PARTICLES ATTACHED TO A SPHERE, WITH AN APPLICATION TO FILTER CLOGGING Ph.D. Thesis
Mary Stuart Hall 1982 82 p
Avail: Univ. Microfilms Order No. DA8227873

Experimental investigations in recent years have revealed that particles captured in a filter do not become evenly distributed on the surface of a collector. Rather long chains of particles called dendrites form, and these dendrites cause an increase in both the efficiency of the filter and the pressure drop across the filter. The effect of a dendrite on the flow field around a collector, as well as the increase in the drag on the collector resulting from the presence of the dendrite is examined. Slender body theory is applied in the development of a numerical solution to the Stokes equations for flow past a multiparticle dendrite attached to a sphere. The solution consists of a superposition of singularities in the flow, the strengths of which are determined numerically. To satisfy the boundary condition on the surface of the sphere, we employ the image system for a stokeslet in the presence of a sphere that was developed by Oseen. Dissert. Abstr.

N83-28374 Colorado Univ., Boulder.
LARGE REYNOLDS NUMBER TURBULENCE PRODUCED BY A ONE CELL GRID Ph.D. Thesis
Thomas Roger Detman 1982 150 p
Avail: Univ. Microfilms Order No. DA8229820

An exploratory analysis of the turbulence produced in a wind tunnel by a one cell grid consisting of four half cylinders placed on the inside walls of the tunnel is presented. This arrangement allows the largest possible grid Reynolds number, and produces the largest scales of turbulent motion for a square duct. Because of the large scales of motion, turbulent processes of both practical and scientific interest develop in the downstream flow. Four main flow regimes are described: (1) a region of initial mixing where the turbulence is produced and fills the tunnel. (2) An outer wall region dominated by the interaction of the large eddies with the constraints and confinement imposed by the tunnel walls, which is shown by inertial damping of the velocity component normal to the wall far into the flow. Previously, this process was studied using a moving wall to eliminate the wall shear layer. (3) The turbulent shear boundary layer developing in the presence of large scale turbulence, a process that occurs in many engineering and geophysical situations. Dissert. Abstr.

N83-28375 Royal Aircraft Establishment, Farnborough (England).
CALCULATION AND MEASUREMENT OF SEPARATED TURBULENT BOUNDARY LAYERS
P. D. Smith, R. C. Hastings, and B. R. Williams 15 Oct. 1982 39 p refs Presented at Euromech 148 on Two-Dimensional Separated Flows, Bochum, West Germany, 13-15 Oct. 1981
(RAE-TM-AERO-1955; BR86356) Copyright. Avail: Issuing Activity

An inverse integral prediction method for the development of separated turbulent boundary layers developed from the lag-entrainment method is described. The inverse method uses the concept of equilibrium separated boundary layer flows and the predicted characteristics of such flow is compared with measurements. The data were obtained with a single-component laser Doppler anemometer set up to measure streamwise components of mean velocity and turbulence intensity. One pair of profiles of the mean velocity and turbulence intensity normal to the wall was obtained. Shear stresses were not measured but values estimated using the data in conjunction with the differential momentum equation are shown. Predicted values of momentum thickness agree with the measured values but the calculation predicts a pressure rise in the separated region whereas the pressure is almost constant in the experiment. Author (ESA)

N83-28376*# Detroit Diesel Allison, Indianapolis, Ind.
ANALYTICAL AND EXPERIMENTAL EVALUATION OF THE HEAT TRANSFER DISTRIBUTION OVER THE SURFACES OF TURBINE VANES Final Report
L. D. Hylton, M. S. Mihelc, E. R. Turner, D. A. Nealy, and R. E. York May 1983 228 p refs
(Contract NAS3-22761)
(NASA-CR-168015; NAS 1.26:168015; EDR-11209) Avail: NTIS HC A11/MF A01 CSCL 20D

Three airfoil data sets were selected for use in evaluating currently available analytical models for predicting airfoil surface heat transfer distributions in a 2-D flow field. Two additional airfoils, representative of highly loaded, low solidity airfoils currently being designed, were selected for cascade testing at simulated engine conditions. Some 2-D analytical methods were examned and a version of the STAN5 boundary layer code was chosen for modification. The final form of the method utilized a time dependent, transonic inviscid cascade code coupled to a modified version of the STAN5 boundary layer code featuring zero order turbulence modeling. The boundary layer code is structured to accommodate a full spectrum of empirical correlations addressing the coupled influences of pressure gradient, airfoil curvature, and free-stream turbulence on airfoil surface heat transfer distribution and boundary layer transitional behavior. Comparison of pedictions made with the model to the data base indicates a significant improvement in predictive capability. A.R.H.

N83-28377# University of Southern California, Los Angeles. Dept. of Aerospace Engineering.
LUNATE-TAIL SWIMMING PROPULSION AS A PROBLEM OF CURVED LIFTING LINE IN UNSTEADY FLOW. 1: ASYMPTOTIC THEORY
H. K. Cheng and Luis E. Murillo Dec. 1982 82 p refs
(Grant NSF CME-79-26003)
(USCAE-139) Avail: NTIS HC A05/MF A01

The asymptotic theory of a high aspect ratio wing in an incompressible flow was generalized to an oscillating domain where the reduced frequency based on the half span, omega, is of unit order. In this domain, the streamwide and cross stream components of the wake vorticities are comparable in magnitude. Together with formulation for a higher reduced frequency, the analysis completes a framework bridging the high and low frequency realms of high aspect ratio, planar wings of arbitrary shapes. In the quasi-steady limit, the work solves the crescent moon wing problem, and provides a basis for explaining Weissenger's method for swept wings; the analysis also generalizes a skew symmetry principle correlating 3 D effects on forward swept and aft swept wings. S.L.

N83-28378*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
EFFECTS OF FLOW SEPARATION AND COVE LEAKAGE ON PRESSURE AND HEAT-TRANSFER DISTRIBUTIONS ALONG A WING-COVE-ELEVON CONFIGURATION AT MACH 6.9
William D. Deveikis Jun. 1983 95 p refs
(NASA-TP-2127; L-15513; NASA 1.60:2127) Avail: NTIS HC A05/MF A01 CSCL 20D

External and internal pressure and cold-wall heating-rate distributions were obtained in hypersonic flow on a full-scale heat-sink representation of the space shuttle orbiter wing-elevon-cove configuration in an effort to define effects of flow separation on cove aerothermal environment as a function of cove seal leak area, ramp angle, and free-stream unit Reynolds number. Average free-stream Mach number from all tests was 6.9; average total temperature from all tests was 3360 R; free-stream dynamic pressure ranged from about 2 to 9 psi; and wing angle of attack

was 5 deg (flow compression). For transitional and turbulent flow separation, increasing cove leakage progressively increased heating rates in the cove. When ingested mass flow was sufficient to force large reductions in extent of separation, increasing cove leakage reduced heating rates in the cove to those for laminar attached flow. Cove heating-rate distributions calculated with a method that assumed laminar developing channel flow agreed with experimentally obtained distributions within root-mean-square differences that varied between 11 and 36 percent where cove walls were parallel for leak areas of 50 and 100 percent. Author

N83-28379# Toronto Univ. (Ontario). Inst. for Aerospace Studies.
PRESSURES INSIDE COUPLED ROOMS SUBJECTED TO SONIC BOOM
A. J. M. Bressers Feb. 1983 111 p refs
(UTIAS-241; ISSN-0082-5263) Avail: NTIS HC A06/MF A01

An acoustic system of two coupled rooms subjected to sonic boom was studied numerically and experimentally. The physical dimensins of the acoustic system are small compared to the wavelength of a sonic boom signal and justify a Helmholtz resonator approach. Oscillation frequencies and damping ratios were calculated for window areas ranging from 0 to 0.6 sq/cm, room volumes ranging from about 7 cubic m to 42 cubic m and the average absorption coefficient ranging from 0 to 0.25. Pressure responses were calculated for similar conditions using sonic boom input signals with durations varying from 100 ms to 300 ms and various rise times between 0 and 0.25 times the duration. The UTLAS Travelling Wave Horn Type Sonic Boom Simulator was available for the experiments. Experiments were conducted, using window areas up to about 0.6 sq cm, and input durations between 100 ms and 300 ms. Very satisfactory agreement was achieved between analysis and experiment by using an average absorption coefficient of 0.25 for both rooms. Author

N83-28380*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
RESIDUAL STRESS IN PLASMA SPRAYED CERAMIC TURBINE TIP AND GAS PATH SEAL SPECIMENS
R. C. Hendricks, G. McDonald, and R. L. Mullen (Case Western Reserve Univ.) 1983 15 p refs Presented at the 7th Ann. Conf. on Ceramics and Advan. Mater., Cocoa Beach, Fla., 16-23 Jan. 1983; sponsored by the American Ceramic Society
(NASA-TM-83418; E-1706; NAS 1.15:83418) Avail: NTIS HC A02/MF A01 CSCL 20D

The residual stresses in a ceramic sheet material used for turbine blade tip gas path seals, were estimated. These stresses result from the plasma spraying process which leaves the surface of the sheet in tension. To determine the properties of plasma sprayed ZrO2-Y2O3 sheet material, its load deflection characteristics were measured. Estimates of the mechanical properties for sheet materials were found to differ from those reported for plasma sprayed bulk materials. Author

N83-28381# San Diego State Univ., Calif. Dept. of Aerospace Engineering and Engineering Mechanics.
EFFECT OF AN INHOMOGENEOUS TRANSITION LAYER ON THE RESPONSE OF A COMPLIANT LAYER DUE TO A SHEAR FLUID DISTURBANCE Final Report, Mar. - Nov. 1982
Mauro Pierucci and Paul Baxley Jan. 1983 55 p refs
(Contract N00014-81-K-0424)
(AD-A125182; SDSU/AE/EM/TR-83-01) Avail: NTIS HC A04/MF A01 CSCL 20/4

The amount of interaction between a fluid and a compliant coating is studied for a one dimensional shear fluid disturbance. A thin inhomogeneous viscoelastic layer is located at the interface between the fluid and the coating. The fluid is assumed to have no mean flow field. The effect of different coating properties, thickness of compliant coating and of transition layer as well as the frequency of oscillations are analyzed. Author (GRA)

N83-28382# Naval Postgraduate School, Monterey, Calif.
DUAL-PHASE NOZZLE FLOW M.S. Thesis
Thomas C. Nollie, Jr. Oct. 1982 196 p refs
(AD-A125730) Avail: NTIS HC A09/MF A01 CSCL 13/10

A review of the dual-phase power system was made. This study focused on the multi-component nozzle of this dual-phase system. First, an existing computer code predicting the nozzle performance was updated, and second a series of experimental tests on a variable area, two-dimensional nozzle was performed to verify the computer code. Author (GRA)

N83-28383# Royal Aircraft Establishment, Farnborough (England).
CALCULATION AND MEASUREMENT OF SEPARATED TURBULENT BOUNDARY LAYERS
P. D. Smith, R. C. Hastings, and B. R. Williams Oct. 1982 39 p refs Presented at Euromech 148 2-Dimensional Separated Flows, Bochum, West Germany, 13-15 Oct. 1981
(AD-A125392; RAE-TM-AERO-1955; DRIC-BR-86356) Avail: NTIS HC A03/MF A01 CSCL 20/4

An inverse integral prediction method for the development of separated turbulent boundary layers developed from the lag-entrainment method is described. The inverse method uses the concept of equilibrium separated boundary layer flows and the predicted characteristics of such flows will be compared with measurements which represent the first known demonstration that equilibrium separated boundary layers can be realised experimentally. In these experiments the data were obtained with a single-component laser Doppler anemometer usually set up to measure streamwise components of mean velocity and turbulence intensity; in addition, however, one pair of profiles of the mean velocity and turbulence intensity normal to the wall was obtained. The separated flow on a NACA 4412 aerofoil has been measured by Wadcock using the flying hot-wire technique. It is shown that predicted values of momentum thickness agree with the measured values but that the calculation predicts a pressure rise in the separated region whereas the pressure is almost constant in the experiment. The result of introducing second order effects into the calculation is shown. The equivalent inviscid flow is constructed and the matching of the equivalent and real flows is considered. GRA

N83-28384# Calspan Field Services, Inc., Arnold Air Force Station, Tenn.
COLLISION NUMBERS IN EXPANDING CONICAL NOZZLE FLOW FIELDS Final Report, 1 Oct. 1979 - 1 Aug. 1980
J. W. Lewis and M. S. Smith Arnold AFS, Tenn. AEDC Feb. 1983 59 p refs
(AD-A125355; AEDC-TR-83-6) Avail: NTIS HC A05/MF A01 CSCL 20/4

The cumulative elastic collision number has been calculated for the supersonic region of isentropic, continuum conical nozzle flow fields for gaseous species characterized by the specific heat ratios Gamma = 5/3, 7/5, and 9/7. The cumulative collision number was determined as a function of Mach number and axial distance parameter Cap x tan 0, the latter specialized to the nozzle half-angles 0 = 5, 10.5, and 15 deg. The calculations were extended to study the effects of the type of intermolecular potential interaction on the cumulative collision number. Specifically, the interaction potentials investigated included the attractive inverse -r6, the Lennard-Jones 12:6, the Stockmayer and Krieger 12: 6:3 potentials, and the hard-sphere interaction. The results have been presented in nondimensional form in terms of the characteristic well-depth energies and ranges of the intermolecular potentials, and the range of the nondimensional reservoir temperature studied was 2 < t0 < 10, which corresponds to the range of approximately 200 to 1000 K for typical nonpolar molecular species. The results obtained for the inverse -r potential using a close-encounter collision model allowed simple scaling of the results with reservoir temperature which was not possible for the two- and three-term potentials. Quantitative comparisons of the results are presented. GRA

N83-28385# San Diego State Univ., Calif. Dept. of Aerospace Engineering and Engineering Mechanics.
NEW DEVELOPMENT ABOUT OPEN SEPARATION
K. C. Wang Jul. 1982 70 p refs

(Grant AF-AFOSR-0109-81; AF Proj. 2307)
(AD-A125676; AE/EM-TR-82-02; AFOSR-83-0119TR) Avail: NTIS HC A04/MF A01 CSCL 20/4

New developments about open separation are discussed. Three-dimensional separation in general can be identified by the convergence (or running-together) of the limiting streamlines in spite that this procedure does not answer all deeper questions. An open separation is shown to start from a regular point in the middle of the surface flow field, this idea is in direct contradiction to the conventional notion of separation and has been a stumbling block for many to accept the open separation concept. The streamline vs. envelope debate remains unsettled even though there are researchers who changed their preference from the envelope to the streamline version. Criticism of open separation is replied in details. Tobak and Peake reversed their previous stand and came to a position essentially the same as ours except in terminology. Cebeci, Khattab and Stewartson objected to our open separation idea on a superficial ground even though this very idea has been supported by all related experiments and calculations. In contract CKS' suggested alternative is a mere speculation with no evidence. Finally the open vs. closed separation concept can be carried over by analogy to unsteady cases. GRA

N83-28386# Iowa Inst. of Hydraulic Research, Iowa City.
CALCULATIONS OF THREE-DIMENSIONAL TURBULENT BOUNDARY LAYERS USING THE CRANK-NICOLSON METHOD Final Report, Oct. 1980 - Aug. 1982
P. A. Krogstad, J. H. Baek, and V. C. Patel Aug. 1982 55 p refs Presented at the Eurovisc Workshop on 3D Boundary Layers, Berlin, Apr. 1982
(Contract N00014-82-K-0200)
(AD-A125648; IIHR-254) Avail: NTIS HC A04/MF A01 CSCL 20/4

This report describes the results of the three dimensional turbulent boundary layer calculations performed for the Eurovisc Workshop held in Berlin on 1 April 1982. It is shown that the present method, based on the Crank-Nicolson finite difference scheme and a simple eddy viscosity model for turbulence, yields satisfactory results provided regions of viscous inviscid interaction, which were present in at least three of the four test cases, are avoided. Author (GRA)

N83-28387# Naval Postgraduate School, Monterey, Calif. Dept. of Aeronautics.
EVALUATION OF THE PERFORMANCE AND FLOW IN AN AXIAL COMPRESSOR M.S. Thesis
John Leighton Waddell Oct. 1982 161 p refs
(AD-A125619) Avail: NTIS HC A08/MF A01 CSCL 13/7

An experimental evaluation of the axial compressor test rig with one stage of symmetric blading was conducted to determine its suitability for studies of tip clearance effects. Measurements were made of performance parameters and internal flow fields. The configuration tested was found to be unsuitable due to poor flow from the inlet guide vanes, particularly near the tip region. Secondary flows and flaws in construction of the guide vanes were suggested as probable causes. Recommendations were made for a program to resolve the problem. Author (GRA)

N83-28388# California Univ., Livermore. Lawrence Livermore Lab.
EXPLORATORY STUDY ON THE APPLICATION OF AN EXISTING FINITE-ELEMENT NAVIER-STOKES CODE TO COMPUTE POTENTIAL FLOWS
Robert L. Lee, Philip M. Gresho, and Robert L. Sani (Colorado Univ.) 15 Jul. 1982 13 p refs Presented at the Intern. Conf. on Finite Element Methods, Shanghai, 2 Aug. 1982
(Contract W-7405-eng-48; Grant DAAG29-81-C-0045)
(DE82-018905; UCRL-86684; CONF-820832-1) Avail: NTIS HC A02/MF A01

The ease with which an existing time dependent code for the incompressible Navier-Stokes equations in primitive variables is used to compute potential flows and the utility of this approach via an example calculation are examined. As a numerical example, the potential flow over a cylinder is considered. The calculations are performed on a single mesh with various piecewise polynomial approximation employed for the dependent variables. A Navier-Stokes finite element code is used in a rather straightforward manner to obtain numerical solutions to potential flow problems. Whereas the Laplace's equation approach generates a solution for the velocity potential only, the mixed formulation obtains both the velocity and potential fields. Better potential flow solutions are obtained from the simpler and less expensive variational method (LF) than the mixed method and that elements which perform well for viscous flows can be very poor for inviscid flows. Author

N83-28389# California Univ., Berkeley. Lawrence Berkeley Lab. Dept. of Mechanical Engineering.
TURBULENCE MODELING OF SINGLE- AND TWO-PHASE CURVED-CHANNEL FLOWS Ph.D. Thesis
Farzad Pourahmadi May 1982 322 p refs
(Contract DE-AC03-76SF-00098)
(DE82-017228; LBL-13808) Avail: NTIS HC A14/MF A01

A theoretical analysis of steady turbulent flow with small solid particulates in suspension was conducted based on the continuum hypothesis for both phases. The analysis provides the basis for a two dimensional numerical model capable of predicting dilute two phase flows. The numerical procedure requires the solution of fully elliptic coupled transport equations for both phases. The turbulence characteristics of the fluid phase are predicted using a two equation (k-epsilon) model of turbulence and involves the calculation of the fluid turbulent kinetic energy (k) and its rate of dissipation (epsilon). DOE

N83-28390# Idaho National Engineering Lab., Idaho Falls.
TOMOGRAPHIC RECONSTRUCTION OF THE TIME-AVERAGED DENSITY DISTRIBUTION IN TWO-PHASE FLOW
J. R. Fincke 1982 13 p refs Presented at the 11th Southeastern Conf. on Theoret. and Appl. Mech., Huntsville, Ala., 8 Apr. 1982
(Contract DE-AC07-76ID-01570)
(DE82-017728; EGG-M-11481; CONF-820402-2) Avail: NTIS HC A02/MF A01

The technique of reconstructive tomography was plied to the measurement of time average density and density distribution in a two phase flow field. The technique of reconstructive tomography provides a model independent method of obtaining flow field density information. A tomographic densitometer system for the measurement of two phase flow has two unique problems: a limited number of data values and a correspondingly coarse reconstruction grid. These problems were studied both experimentally through the use of prototype hardware on a 3 in. pipe, and analytically through computer generation of simulated data. The prototype data were taken on phantom constructed of all Plexiglas and Plexiglas laminated with wood and polyurethane foam. Reconstructions obtained from prototype data are compared with reconstructions from the simulated data. Also presented are some representative results in a horizontal air/water flow. DOE

N83-28391# Illinois Univ., Urbana. Dept. of Mechanical and Industrial Engineering.
MEASUREMENT OF SOLIDS MOTION IN GAS-FLUIDIZED BEDS Technical Progress Report, 1 Dec. 1981 - 28 Feb. 1982
M. M. Chen and B. T. Chao 1982 9 p refs
(Grant DE-FG22-81PC-40804)
(DE82-012744; DOE/PC-40804/T2) Avail: NTIS HC A02/MF A01

The research concerns the measurement of solid particle velocity distribution and residence time distribution using a computer aided radioactive particle tracing technique. Microspheres were machined from a scandium rod and coated with polyester urethane. The design of the 1 m fluidized bed is nearly complete. DOE

N83-28392# California Univ., Irvine. Dept. of Mechanical Engineering.
EFFECT OF SOLID PARTICLES ON THE TURBULENCE FLOW OF A ROUND GASEOUS JET. MATHEMATICAL AND EXPERI-

MENTAL STUDY Quarterly Technical Progress Report, 1 Mar. - 31 May 1982
S. E. Elghobashi 15 Jun. 1982 9 p refs
(Contract DE-FG22-80PC-30303)
(DE82-017093; DOE/PC-30303/T4) Avail: NTIS HC A02/MF A01

The mathematical study aims at developing and validating a numerical solution procedure which predicts turbulent two phase flows consisting of light carrier fluid and a dispersed phase of solid spherical particles of uniform size. The procedure embodies a new two equation turbulence model which accounts for the influence of the dispersed phase on the structure of turbulence. The modeling of the various turbulence correlations is now complete. The finite difference form of the equations was coded; the code was debugged and preliminary results were obtained and compared with the experimental data. DOE

N83-28393# Iowa Univ., Iowa City. Div. of Energy Engineering.
CONVECTIVE AND RADIATIVE TRANSFER FOR TURBULENT FLOW IN ENERGY SYSTEMS Final Report
Theodore F. Smith and Ching Jen Chen Dec. 1982 21 p refs
(Contract DE-AC02-79ER-10515)
(DE83-006598; DOE/ER-10515/1; TR-E-TFS-82-003) Avail: NTIS HC A02/MF A01

Combined convective and radiative heat transfer for turbulent flow of a radiatively participating gas through circular ducts were examined. The results will provide a better understanding of the various energy transport mechanisms occurring in energy systems and yield mathematical methods for evaluation of gas velocity and temperature profiles when convection and radiation are simultaneously considered. The research accomplishments during the grant period of September 1, 1979 to November 30, 1982 are outlined. DOE

N83-28394# Dartmouth Coll., Hanover, N.H. School of Engineering.
EXPERIMENTAL STUDY OF LIQUID FILM FRACTION AND PRESSURE DROP CHARACTERISTICS IN VERTICAL COUNTERCURRENT ANNULAR FLOW
D. L. Hawley and G. B. Wallis Feb. 1982 172 p refs
(EPRI Proj. 443-2)
(DE82-903146; EPRI-NP-2280) Avail: NTIS HC A08/MF A01

The occurrence of a region of rough, highly agitated film in countercurrent annular air-water flow in a vertical tube is described. The principal objective is to determine criteria for the formation and development of this regime. A theoretical model of countercurrent annular flow is developed from momentum transfer and continuity considerations. This analysis indicates that for each combination of allowable flow rates, two equilibrium values of film thickness are possible. The thin film equilibrium solution is approached below an upper boundary condition and the thicker solution is approached above a lower boundary condition. In the former case, wall shear stress balances most of the weight of the water film and in the latter, interfacial shear stress largely supports the film. DOE

N83-28395# Dartmouth Coll., Hanover, N.H. School of Engineering.
INTERFACIAL FRICTION IN COCURRENT UPWARD ANNULAR FLOW Final Report
L. M. Hossfeld, D. Bharathan, G. B. Wallis, and H. J. Richter Mar. 1982 135 p refs
(EPRI Proj. 443-2)
(DE82-903119; EPRI-NP-2326) Avail: NTIS HC A07/MF A01

Cocurrent upward annular flow is investigated, with an emphasis on correlating and predicting pressure drop. Attention is given to the characteristics of the liquid flow in the film, and the interaction of the core with the film. Alternate appraoches are discussed for correlating suitably defined interfacial friction factors. Both approaches are dependent on knowledge of the entrainment in order to make predictions. Dimensional analysis is used to define characteristic parameters of the flow and an effort is made to determine, to the extent possible, the influences of these parameters on the interfacial friction factor. DOE

N83-28396# Oak Ridge National Lab., Tenn. Energy Div.
STUDY OF HEAT AND MASS TRANSFER IN EVAPORATIVE COOLERS
Horacio Perez-Blanco and W. A. Bird Jun. 1982 38 p refs
(Contract W-7405-eng-26)
(DE82-017615; ORNL/TM-8150) Avail: NTIS HC A03/MF A01

Evaporative coolers are generally considered efficient and economical devices for rejecting waste heat. In these coolers, a hot fluid circulates inside tubes, rejecting heat to a mixture of air and water. Water is sprayed on the tubes and flows downward while air circulates upward; thus, latent and sensible heat is transferred from the water to the air. Commercially available coolers are of the horizonal tube type; a vertical tube evaporative cooler is studied because it is possible to enhance condensing heat transfer coefficients by using vertical fluted tubes. A mathematical model describing the performance of a single tube is formulated which can predict performance for varied inlet conditions, thereby eliminating the need for extensive testing. The validity of the model rests on the accuracy of the controlling heat and mass transfer coefficients used, so these coefficients are measured experimentally in a single tube cooler and found to agree with existing empirical correlations. DOE

N83-28397# Science Applications, Inc., La Jolla, Calif.
IMPLICIT STEALTH: A SPECIAL VERSION OF STEALTH FOR LOW-SPEED FLUID-FLOW ANALYSIS. IMPLICIT HYDRODYNAMICS VERSIONS Final Report
M. W. McKay May 1982 66 p refs Sponsored by EPRI
(EPRI Proj. 965-5)
(DE82-904651; EPRI-NP-2385) Avail: NTIS HC A04/MF A01

STEALTH is a family of computer codes that solve the equations of motion for a general continuum. These codes are used to calculate a variety of dynamic physical processes associated with nuclear reaction design and analysis as well as other physical processes in which the dynamic behavior of a continuum is involved. The versions of STEALTH described were designed for the calculation of problems involving lower speed fluid flow. They employ an implicit finite difference technique to solve the one and two dimensional equations of motion, written for an arbitrary coordinate system, for both incompressible and compressible fluids. The solution technique involves and iterative solution of the implicit, Lagrangian, finite difference equations followed by a separate calculation of the convection terms resulting from the use of an arbitraarily moving coordinate system. DOE

N83-28398# Vetter Research, Costa Mesa, Calif.
FLOW OF PARTICLE SUSPENSIONS THROUGH POROUS MEDIA
O. J. Vetter, V. Kandarpa, and A. Harouaka 22 Jun. 1982 68 p refs
(Contract DE-AC03-78ET-27146)
(DE82-017257; DOE/ET-27146/T10) Avail: NTIS HC A04/MF A01

A new attempt to study the mechanisms of particle invasions into porous media was made. The following subjects are described: A critical survey of the literature indicating that the mechanism of particle invasions is not known in sufficient detail. The pros and cons of existing particle measuring devices are briefly described. Results from a new laboratory study on particle characterizations are given. The results of the laboratory studies on the flow of particle suspensions through porous media (up to 200 md) are discussed. The effects of flow rate and particle concentrations on the amount of damage (i.e., permeability impairment) and depth of penetration (from core inlet towards outlet) are particularly emphasized. Filter methods (e.g., using millipore filter) cannot be used to determine particle invasions into porous medium. Any predictions of the injection problems based on millpore for (or any other filter) measurements are useless and should be discarded. DOE

N83-28399# California Univ., Berkeley. Lawrence Berkeley Lab. Materials and Molecular Research Div.

EFFECT OF SUSPENDED PARTICLES ON THE RATE OF MASS TRANSFER TO A ROTATING-DISK ELECTRODE

R. H. Muller, D. J. Roha, and C. W. Tobias Jun. 1982 15 p refs Presented at the Spring Meeting of the Electrochem. Society, Montreal, 9 May 1982

(Contract DE-AC03-76SF-00098)

(DE82-018802; LBL-13813; CONF-820508-3) Avail: NTIS HC A02/MF A01

The addition of 0 to 40 vol % spherical glass particles of 4 to 75 microns diameter to the electrolyte was found to significantly increase limiting currents for the reduction of Fe(CN)5 (-3) on rotating disk electrodes. The increase is largest, more than three fold, at high rotation speeds (2870 rpm), large electrodes (1.41 cm radius), high particle content (40 vol %) and intermediate particle diameter (approx. 10 microns). Calculations of viscous power dissipation have shown that increasing limiting current by the addition of particles at constant rotation rate requires a much lower increasing in stirring power than that required for obtaining the same limiting current by use of higher rotation rate in the absence of particles. A tentative theoretical model, involving mass transfer enhancement by means of a fresh fluid layer entrained by rotating particles, provides reasonable agreement with observed behavior. DOE

N83-28400# Tennessee Univ., Knoxville. Dept. of Mechanical and Aerospace Engineering.

PERFORMANCE CHARACTERISTICS OF PLANE-WALL VENTURI-LIKE REVERSE FLOW DIVERTERS

G. V. Smith and R. M. Counce (ORNL) 1982 8 p refs Presented at the Automatic Control Conf., Arlington, Va., 14-16 Jun. 1982

(Contract W-7405-eng-26)

(DE82-017424; CONF-820692-2) Avail: NTIS HC A02/MF A01

The results of an analytical and experimental study of plane wall Venturi-like reverse flow diverters (RFD) are presented. In general, the flow characteristics of the RFD are reasonably well predicted by the mathematical model of the RFD, although a divergence between theory and data is observed for the output characteristics in the reverse flow mode as the output impedance is reduced. Overall, the performance of these devices indicates their usefulness in fluid control and fluid power systems, such as displacement pumping systems. DOE

N83-28401# State Univ. of New York, Stony Brook. Dept. of Mechanical Engineering.

SIMULTANEOUS MEASUREMENTS AND FLOW VISUALIZATION IN A PLANE MIXING LAYER

S. V. Sherikar and R. Chevray 1982 7 p ref Presented at the Intern. Symp. on Appl. of Laser-Doppler Anemometry to Fluid Mech., Lisbon, 5 Jul. 1982

(Contract DE-AC02-79ER-10439)

(DE82-007787; DOE/ER-10439/5; CONF-820706-1) Avail: NTIS HC A02/MF A01

Wind tunnel experiments performed to determine the flow characteristics of a plane mixing layer are described. Two parallel streams of air moving at different velocities were separated by a splitter plate prior to their mixing in the test section. Gaseous NH3 and gaseous HCl were introduced near the splitter plate to produce an ammonium chloride aerosol which made flow visualization possible. Flow visualization records (movies) and velocity measurements, using laser-Doppler-velocimeters tracking silicone oil particles in the flow, were made simultaneously and synchronized using a chopped beam of a He-Ne laser which left a signature on the move film and provided a signal for flow rate data acquisition. Analysis of these synchronized data verified the existence of large, essentially two-dimensional coherent structures in the plane mixing layer. Author

N83-28402# Pennsylvania State Univ., University Park.

PREDICTION OF THE FRICTION FACTOR FOR THE OFFSET STRIP-FIN MATRIX

R. L. Webb and H. M. Joshi 1983 9 p refs Presented at the Joint ASME-JSME Thermal Sci. Conf., Honolulu, Haw., 20-25 Mar. 1983

(Contract DE-AC02-79ER-10394)

(DE83-008631; DOE/ER-10394/2; CONF-830301-10) Avail: NTIS HC A02/MF A01

This work presents an analytical model and a semi-empirical correlation to predict the friction factor in the offset strip-fin matrix. Previously reported data on eight test sections were used to test the model and to develop the correlation. The analytical model assumes laminar flow and is based on a numerical solution for zero-thickness fins. It predicts 90% of the data below a Reynolds number of 2000 within + or - 10%. At higher Reynolds numbers the predicted values show increasing error because of vortex shedding in the wake, which is not accounted for by the laminar model. A semi-empirical correlation is developed that predicts 93% of the data within - 10% in the range $300 < Re < 3600$. DOE

N83-28403# Technische Hogeschool, Delft (Netherlands). Lab. for Aero- and Hydrodynamics.

A THEORETICAL MODEL FOR CORE-ANNULAR FLOW OF A VERY VISCOUS OIL CORE AND A WATER ANNULUS THROUGH A HORIZONTAL PIPE

G. Ooms, A. Segal, A. J. vanderWess, and R. V. A. OLiemans (Koninklijke/Shell-Lab., Amsterdam) Jul. 1982 29 p ref

(WTHD-147) Avail: NTIS HC A03/MF A01

The mechanism by which the buoyancy force on the core, resulting from any density difference between oil and water, is counterbalanced in a theoretical model of core-annular flow of a viscous oil core and a water annulus through a pipe was analyzed. Oil viscosity was assumed to be so high that any flow in the core may be neglected, therefore there is no variation with time of the oil-water interface form. The core was assumed to be solid and the interface to be a solid-liquid interface. By means of the hydrodynamic lubrication theory, it is proved that, due to the movement of ripples present in the core surface with respect to the pipe wall, pressure variations occur in the annular layer, which exert a force on the core. This force can be so large that the buoyancy force is counterbalanced. Author (ESA)

N83-28404# Technische Hogeschool, Delft (Netherlands). Lab. for Aero- and Hydrodynamics.

WAVE PROPAGATION, COLLAPSE, VELOCITY AND SHEAR STRESS DISTRIBUTION IN AN ORTHOTROPIC VISCOELASTIC TUBE OF INFINITE LENGTH

G. D. C. Kuiken Mar. 1982 43 p refs Submitted for publication

(WTHD-148-Pt-1) Avail: NTIS HC A03/MF A01

The dispersion equation for an initially stressed tube of finite length is derived. The fluid properties are elasticoviscous. The properties of the orthotropic wall are viscoelastic. Numerical solution of the dispersion equation shows that for the higher frequencies many more roots are obtained besides the classical Lamb and Young mode. For larger distances from the support certain roots show negative attenuations. The effects of the elasticity of the fluid on the roots are not as large as the effects of the viscosity of the wall. Variations of the boundary conditions at the support of the tube can be neglected at distances from the support of the order of one diameter of the tube. Previously reported shell equations are shown to be incorrect. Author (ESA)

N83-28405# Technische Hogeschool, Delft (Netherlands). Lab. for Internal Combustion Engines and Gas Turbines.

A STUDY OF FLOW PHENOMENA IN INTERNAL (PISTON) COMBUSTION ENGINES

Jan Jeen Seppen Oct. 1982 156 p refs

(WTHD-149) Avail: NTIS HC A08/MF A01

A zero dimensional model of the intake stroke, and a three dimensional model of the inlet port flow (for the cylinder head swirl coefficient) of an internal combustion engine were developed. Electric discharge anemometers were designed in order to check model predictions. Tests on a motorcycle engine show that solid body approximation, used in the zero dimension model, is practicable, although the intake flow still has a clear effect during the compression stroke. The calculated initial swirl rev is much lower

than measured. Measurements in a direct injection diesel engine were compared with initial conditions of the 3-D simulation. The calculated initial swirl rev is higher than measured. The calculated and measured results of the swirl coefficient agree. Author (ESA)

N83-28406# Technische Hogeschool, Delft (Netherlands). Lab. for Aero- and Hydrodynamics.
ON THE SUSPENSION MECHANISM OF SMALL HEAVY PARTICLES IN A HORIZONTAL TURBULENT BOUNDARY LAYER FLOW, PIPE FLOW OR CHANNEL FLOW
G. Ooms and F. G. J. Absil Feb. 1983 25 p refs
(WTHD-151) Avail: NTIS HC A02/MF A01

Developments of Lumley's mixing length model for the heavy particle suspension mechanism are summarized. Lumley's model is only valid in the constant stress layer, not in the viscous sublayer and generation layer. Experimental results show that in the latter regions deposition occurs in downsweeps, whereas particle detachment and reentrainment are caused by ejections. Predictions of a model for the heavy particle suspension mechanism in the viscous sublayer and generation layer based on the existence of such flow phenomena are confirmed by experimental data. In this model there is no influence of the particles on the turbulent flow. Author (ESA)

N83-28407# Technische Hogeschool, Delft (Netherlands). Lab. for Aero- and Hydrodynamics.
ON THE INFLUENCE OF THE EXIT CONDITIONS ON THE ENTRAINMENT RATE IN THE DEVELOPMENT REGION OF A FREE, ROUND, TURBULENT JET
H. Fondse, H. Leijdens, and G. Ooms Feb. 1983 28 p refs
(WTHD-152) Avail: NTIS HC A03/MF A01

The influence of the exit conditions on the entrainment rate in the axisymmetric mixing layer region and at a distance of 20D of the nozzle was investigated. The entrainment rate at 20D depends on the exit boundary layer state, and on the turbulence intensity of the core. A laminar exit boundary layer shows the highest entrainment rate. A turbulent one reduces the entrainment rate at 20D by 15%. A grid placed at the nozzle exit, in order to increase the turbulence intensity of the core, reduces the entrainment rate at 20D by 40%. An empirical relation for the entrainment rate at the end of the mixing layer region as a function of the mixing layer parameters predicts the entrainment rate at 20D within an accuracy of 5%. Possibly there is no asymptotic region fully independent of the mixing layer processes, and not influenced by the exit conditions via the influence on these processes. Author (ESA)

N83-28408# Technische Hogeschool, Delft (Netherlands). Dept. of Aerospace Engineering.
THE EQUATIONS FOR A THREE-DIMENSIONAL TRANSIENT FLOW OF A MULTICOMPONENT GAS MIXTURE WITH CHEMICAL REACTIONS
J. B. Vos Nov. 1982 27 p refs Prepared in cooperation with Prins Maurits Lab. TNO
(Contract STW-DLR-11.0120)
(VTH-LR-362; PML-1982-149; SFCC-Publ-2) Avail: NTIS HC A03/MF A01

The conservation equations and transport coefficients for transient gas flow in a solid fuel combustion chamber are presented. Chemical reaction kinetics are described. The conservation equations are modeled for turbulence, using Reynolds decomposition of the dependent variables and time averaging of the resulting equations. Author (ESA)

N83-28037*# Jet Propulsion Lab., California Inst. of Tech., Pasadena. Ground Facilities and Antenna Engineering Sect.
THE APPLICATION OF THE IMPLICIT ALTERNATING-DIRECTION NUMERICAL TECHNIQUE TO THERMAL ANALYSIS INVOLVING CONDUCTION AND CONVECTION
R. D. Hughes and T. Charng *In its* The Telecommun. and Data Acquisition Rept. 15 May 1983 p 119-127 refs (For primary document see N83-28025 17-12)
Avail: NTIS HC A09/MF A01 CSCL 20D

35 INSTRUMENTATION AND PHOTOGRAPHY

Includes remote sensors; measuring instruments and gages; detectors; cameras and photographic supplies; and holography.

For aerial photography see *43 Earth Resources.* For related information see also *06 Aircraft Instrumentation,* and *19 Spacecraft Instrumentation.*

N83-28409 Royal Aircraft Establishment, Farnborough (England).
THE THEORY OF AN ATTITUDE AND POSITION MEASURING TECHNIQUE USING TWO CAMERAS INCORPORATING LINEAR CHARGE COUPLED IMAGING ARRAYS
J. Knight 24 May 1982 39 p refs
(RAE-TR-82057; RAE-IT-178; BR84652) Copyright. Avail: Issuing Activity

The derivation of the equations relating the position and attitude of a cylindrical object to the sight-line tangent angles measured in two vertical planes is presented together with an iterative technique for their solution. The intended application is the study of the behavior of stores ejected from aircraft wing pylons. The convergence of the iterative technique is illustrated by results obtained with a program written for a TI59 calculator. Simple first order approximations are derived for the dependence of attitude and position errors on both measurement errors and errors in setting up the camera geometry. It is shown that the resultant attitude errors can be very many times greater than the measurement errors causing them and that the technique is best suited to long stores, enabling a wide separation of the camera planes, and for relatively short range viewing. Author (ESA)

N83-28410*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
RADIOMETER REQUIREMENTS FOR EARTH-OBSERVATION SYSTEMS USING LARGE SPACE ANTENNAS
Lloyd S. Keafer, Jr. and Richard F. Harrington Jun. 1983 44 p refs
(NASA-RP-1101; L-15429; NAS 1.61:1101) Avail: NTIS HC A03/MF A01 CSCL 14B

Requirements are defined for Earth observation microwave radiometry for the decade of the 1990's by using large space antenna (LSA) systems with apertures in the range from 50 to 200 m. General Earth observation needs, specific measurement requirements, orbit mission guidelines and constraints, and general radiometer requirements are defined. General Earth observation needs are derived from NASA's basic space science program. Specific measurands include soil moisture, sea surface temperature, salinity, water roughness, ice boundaries, and water pollutants. Measurements are required with spatial resolution from 10 to 1 km and with temporal resolution from 3 days to 1 day. The primary orbit altitude and inclination ranges are 450 to 2200 km and 60 to 98 deg, respectively. Contiguous large scale coverage of several land and ocean areas over the globe dictates large (several hundred kilometers) swaths. Radiometer measurements are made in the bandwidth range from 1 to 37 GHz, preferably with dual polarization radiometers with a minimum of 90 percent beam efficiency. Reflector surface, root mean square deviation tolerances are in the wavelength range from 1/30 to 1/100. Author

N83-28411# Lehigh Univ., Bethlehem, Pa.
DEVELOPMENT OF A FIBER-OPTIC DOPPLER ANEMOMETER FOR BUBBLY TWO-PHASE FLOWS Final Report
S. Neti and G. M. Colella Jan. 1983 120 p refs
(EPRI Proj. 1159-3)
(DE83-901477; EPRI-NP-2802) Avail: NTIS HC A06/MF A01

Fiber optic laser anemometer systems capable of measurements in two phase bubbly flows were developed. These instruments have great potential for use in the many two phase flow research areas associated with nuclear reactors and other power generating systems. Multimode graded index optical fibers were used to transmit both the illuminating light from the laser to the

point of measurement, and the scattered light to the photodetector. The use of optical fibes allowed miniaturization of the anemometer and remote measurements from the laser and photodetector. The two optical geometries developed are the prism fiber optic Doppler anemometer and the Dot fiber optic Doppler anemometer. DOE

N83-28412# California Univ., Berkeley. Lawrence Berkeley Lab. Engineering and Technical Services Div.
NTD GERMANIUM: A NOVEL MATERIAL FOR LOW-TEMPERATURE BOLOMETERS
E. E. Haller, N. P. Palaio, M. Rodder, W. L. Hansen, and E. Kreysa Jun. 1982 15 p refs Presented at the 4th Intern. Neutron Transmutation Doping Conf., Gaithersburg, Md., 1-3 June. 1982 Submitted for publication
(Contract DE-AC03-76SF-00098)
(DE82-018580; LBL-14649; CONF-8206100-1) Avail: NTIS HC A02/MF A01

Six samples of ultra pure (absolute value N/sub A/ - N/sub D/ absolute value cu cm 10 cu cm, single crystal germanium were neutron transmutation doped with neutron doses between 7.5 quadrillion and 1.88 quintillion sq cm. After thermal annealing at 400 C for six hours in a pure argon atmosphere, the samples were characterized with Hall effect and resistivity measurements between 300 and 0.3 K. Results show that the resistivity in the low temperature, hopping conduction regime can be approximated with rho = rho exp (sub o T). The three more heavily doped sampls show values for rho delta and sub o ranging from 430 to 3.3 omega cm and from 4.9 to 2.8 K, respectively. The excellent reproducibility of neutron transmutation doping and the values of rho sub o and delta make NID Ge a prime candidate for the fabrication of low temperature, low noise bolometers. DOE

N83-28413# Oak Ridge National Lab., Tenn.
SUPPORT ELECTRODE TORQUE ON A SPHERICAL SUPERCONDUCTING GYROSCOPE
Louis B. Holdeman (NBS, Washington, D.C.) and Jonas T. Holdeman, Jr. 1982 17 p refs Presented at Near Zero Conf., Stanford, Calif., 24 Mar. 1982
(NASA Order H-27908B; Contract W-7405-eng-26)
(NASA-CR-170356; NAS 1.26:170356; DE82-017519; CONF-820372-2) Avail: NTIS HC A02/MF A01 CSCL 14B

The simplest case of a single electrode is considered. Determination of the mixed boundary condition for this potential leads to dual series equations. Collins' solution to a Fredholm integral equation of the second kind is discussed. This equation is transformed into an infinite set of linear equations from which the coefficients in the dual series equation can be calculated using standard techniques. DOE

N83-28414# California Univ., Berkeley. Lawrence Berkeley Lab.
THEORETICAL ANALYSIS OF THE USE OF GERMANIUM DETECTORS FOR TIME-OF-FLIGHT EMISSION TOPOGRAPHY
J. Llacer, H. Spieler, and F. S. Goulding May 1982 7 p refs Presented at IEEE Computer Soc. Workshop on Time-of-Flight Positron Tomography, St. Louis, 17 May 1982
(Contract DE-AC03-76SF-00098)
(DE82-018779; LBL-14401; CONF-8205105-2) Avail: NTIS HC A02/MF A01

A theoretical analysis of the timing capabilities of Ge semiconductor detectors in time-of-flight positron emission tomography is presented. The effect of detector size on efficiency and time resolution is discussed. The relevant noise sources are determined and the optimum filter is derived to optimize the slope to noise ratio, while minimizing the effect of collection time variations on time resolution. The performance of the ideal filter is compared with a single RC integrator. For a lower energy threshold of 200 keV, time resolution of better than 250 ps seems to be a realistic goal for a detector of .25 sq cm cross section and 3 cm length. This detector would yield an overall efficiency of 36% for 511 keV gamma rays and 80% of the detected photons would fall in the Gaussian part of the timing spectrum. DOE

N83-28415# California Univ., Livermore. Lawrence Livermore Lab.
ABSOLUTELY CALIBRATED SOFT-X-RAY STREAK CAMERA FOR LASER-FUSION APPLICATIONS
Robert L. Kauffman, Hector Medecki, and Gary Stradling 1982 26 p refs Presented at the 15th Intern. Congr. on High Speed Phot. and Photonics, San Diego, Calif., 22-27 Aug. 1982
(Contract W-7405-eng-48)
(DE82-018397; UCRL-87190; CONF-820824-4) Avail: NTIS HC A03/MF A01

The intensity output of a soft-X-ray stream camera was calibrated (SXRSC) in order to make absolute flux measurements of X rays emitted from laser-produced plasmas. The SXRSC developed at LLNL is used to time-resolve X-ray pulses to better than 20 ps. The SXRSC uses a Au photocathode on a thin carbon substrate which is sensitive to X-rays from 100 eV to greater than 10 keV. Calibrations are done in the dynamic mode using a small laser-produced X-ray source. The SXRSC is calibrated by comparing its integrated signal to the output of calibrated X-ray diodes monitoring the source strength. The measured SXRSC response is linear over greater than two orders of magnitude. Using these calibrations, absolute intensities can be measured to an accuracy of + -30%. DOE

N83-28416# Oak Ridge National Lab., Tenn.
DECALIBRATION OF SHEATHED THERMOCOUPLES
R. L. Anderson, J. D. Lyons, T. G. Kollie (Oak Ridge Y-12 Plant, Tenn.), W. H. Christie, R. Eby et al 1982 75 p refs Presented at the 6th Symp. on Temperature, Washington, D.C., 14-18 Mar. 1982
(Contract W-7405-eng-26)
(DE82-008839; CONF-820306-6) Avail: NTIS HC A04/MF A01

The decalibration of sheathed thermocouples at high temperatures has been studied by a variety of methods including inhomogeneity testing, calibration, metallography, and an ion microprobe mass analyzer. The results clearly show that the sheathed thermocouple is a complex system at elevated temperatures and that the thermoelements can be contaminated by the diffusion of materials through the insulation from the sheath. Decalibration of base-metal thermocouples is more severe in stainless steel sheaths than in high-nickel alloy sheaths such as Inconel 600. Decalibration tests have been run on Chromel versus Alumel and Nicrosil versus Nisil in vacuum and in argon atmospheres with both sheathed assemblies and bare wire. The decalibrations of both types of thermocouples are similar under these conditions. Author

N83-28417# SRI International Corp., Menlo Park, Calif.
EPRI AUTOMATED TELEPHOTOMETER: FIELD TEST, COLOR-MEASURING CAPABILITY AND DATA ANALYSIS Final Report
W. E. Evans and W. Viezee May 1982 106 p refs Sponsored by EPRI
(EPRI Proj. 1630-10)
(DE82-904642; EPRI-EA-2386) Avail: NTIS HC A06/MF A01

A prototype instrument tha can routinely monitor daytime atmospheric visibility and visibility impairment, including visual discoloration of scenic targets with emphasis on pristine areas was field tested. The system was programmed to monitor nine visibility targets on a daily routine basis. No malfunctions occurred, and a large data base of brightness measurements was recorded. Initial measurements of scene color were also made. A multispectral (color) capability was developed after the test. Current analysis and interpretation procedures follow the methods of tristimulus colorimetry. Data analysis software for the photopic system was developed. The system can now routinely monitor such classical measures of visibility as horizon contrast, visual range, and prevailing visibility, and can also quantify other indices of atmospheroic clarity such as terrain detail and structure. The assembled prototype instrument was characterized and documented, and is available in photopic or color mode. DOE

N83-28418# Sandia Labs., Albuquerque, N. Mex.
YTTERBIUM FLUID-COUPLED GAGE

Carl Smith and George W. Burnside 1982 11 p refs Presented at the DNA Conf. on Instrumentation for Nucl. Weapons Effects, White Oak, Md., 30 Mar. - 1 Apr. 1982
(Contract DE-AC04-76DP-00789)
(DE82-008922; SAND-82-0409C; CONF-820334-1) Avail: NTIS HC A02/MF A01

The piezoresistive ytterbium fluid coupled gage is a useful tool to measure the radial stress time waveform in divergent flow fields. Fluid coupling eliminates lateral strain effects shich would compromise the output and eliminates the ytterbium gage hysteresis seen in unaxial strain conditions. A field experiment shows that fluid coupled gages exhibit no serious under-registration effects at the one kilobar stress level and show good amplitude agreement with a radial stress measurement. DOE

N83-28419# Oak Ridge Y-12 Plant, Tenn. Plant Lab. Dept.
COMPRESSION EQUATIONS FOR MERCURY POROSIMETRY
R. W. Smithwick, III May 1982 25 p refs
(DE82-016639; Y/DK-306) Avail: NTIS HC A02/MF A01

Methods for obtaining isothermal pressure-volume data using a mercury porosimeter and for completely correcting this data for compression effects are described. The isothermal compressions of several liquids were measured with a 103 MPa (15,000 psi) mercurcy porosimeter using the principles described. The porosites and surface areas of several areas of several macroporous solids were accurately measured. DOE

N83-28420# California Univ., Livermore. Lawrence Livermore Lab.
RECENT DEVELOPMENTS IN TH DISSECTOR/RESTORER FRAMING CAMERA TUBE
R. Kalibjian, S. W. Thomas, J. P. Henz, and R. L. Peterson Jun. 1982 13 p refs Presented at the 15th Intern. Congr. on High Speed Phot. and Photonics, San Diego, Calif., 21 Aug. 1982
(Contract W-7405-eng-48)
(DE82-018394; UCRL-86930; CONF-820824-5) Avail: NTIS HC A02/MF A01

The dissector/restorer framing camera tube was characterized with a Nd:YAG mode locked laser. The 3 frame format tube has a .25 sq cm field of view (referenced to the photocathode) and 0.3 ns duration frames with better than 5 1p/mm spatial resolution (at cathode) using microwave triode tube driver. DOE

N83-28421# Stockholm Univ. (Sweden). Dept. of Meteorology.
THE ABSOLUTE INTENSITY CALIBRATION OF 1 M EBERT-FASTIE SPECTROMETER
Berthold Nilsson and Jacek Stegman Jan. 1983 64 p refs In SWEDISH; ENGLISH summary
(Contract SWEDBSA-52/81)
(AP-21; ISSN-0280-4441) Avail: NTIS HC A04/MF A01

An absolute intensity calibration of the 1 m Ebert-Fastie spectrometer in the wavelength region 300 to 800 nm was performed. As a calibration standard an absolutely calibrated quartz-halogen lamp and a freshly smoked Mg0 screen were used. A number of different spectral lamps were used to establish a wavelength in a given order. The spectrometer is used for ground-based measurements of spectra of airglow and aurora. Author (ESA)

N83-28422# European Space Agency, Paris (France).
STUDY OF A CHANNEL SELECTION SYSTEM
M. Dinguirard May 1983 38 p ref Transl. into ENGLISH of "Etude d'un Systeme de Selection des Canaux pour la Camera MRVIR (Moyenne Resolution Visible - Infrarouge)" Rept. CERT-3/6026-DERO ONERA, Toulouse, Jul. 1976
(ESA-TT-786; CERT-3/6026-DERO) Avail: NTIS HC A03/MF A01

The spectral separation of a mean resolution (visible to infrared) camera which can be carried on board an orbital platform was studied. A dispersive system with a grating which operates in the first three orders, and systems which use a prism or field separation were considered. Channel separation can be achieved by: a dichroic plate which eliminates the thermal channel either by reflecting it or transmitting it, without absorption, from 0.5 to 2.5 microns; a grating spectrometer with a direct image of the Earth given by the telescope as entrance slit, aperture = that of the telescope, two-zone grating of the D2B type; 3 bandpass filters (1 micron) centered on 0.55; 0.65 and 0.765 microns; or 3 dichroic plates (which can act as exit slits for the 3 paths of the spectrometer). The system grating has compact assembly and good performance, but precise positioning of the filters separating the three paths at the system's exit, and of all the optical parts is diffcult. The prismatic system presents great practical problems, but is worth investigating. The separator plate for the thermal band can be replaced by separation in the field, but ground processing becomes too complicated. In every case the greatest problem is the provision of near IR detectors. Author (ESA)

N83-28423# European Space Agency, Paris (France).
FLIGHT CALIBRATION SYSTEM OF THE HRV CAMERA (FIGURES)
J.-M. Maisonneuve, M. Dinguirard, and B. Duchenne Apr. 1983 82 p Transl. into ENGLISH of "Dispositif d'Etalonnage en Vol de la Camera HRV, (Figures)', ONERA, Toulouse Report CERT-3/6056-DERO, Nov. 1979
(ESA-TT-795; CERT-3/6056-DERO) Avail: NTIS HC A05/MF A01

Flight calibration data for an optical device with a tungsten filament lamp, and an optical fibers device which catches the Sun illumination, used in the HRV camera of the SPOT satellite are presented. Author (ESA)

N83-28424# European Space Agency, Paris (France).
RESULTS OF QUALIFICATION TESTS FOR THE INFLIGHT CALIBRATION LAMP OF THE HRV CAMERA USED IN THE SPOT PROJECT
Jean-Michel Maisonneuve, Denis Chauve, and Madeleine Plantec Apr. 1983 175 p refs Transl. into ENGLISH of "Resultats de Essais de Qualification de la Lampe d'Etalonnage en Vol de la Camera HRV du Projet Spot', ONERA, Toulouse Report CERT-1/6038-6-DERO, Nov. 1981
(ESA-TT-796; CERT-1/6038-6-DERO) Avail: NTIS HC A08/MF A01

Uniformity curves obtained during the qualification program for the flight calibration lamp of the HRV recording instrument (SPOT project) are presented. Irradiation test, life endurance test, rupture test, duty cycling in a thermal vacuum chamber, storage test, vibration test, and benchmark lamp data are given. Author (ESA)

N83-28425# European Space Agency, Paris (France).
RESULTS OF QUALIFICATION TESTS FOR THE INFLIGHT CALIBRATION LAMP OF THE HRV CAMERA USED IN THE SPOT PROJECT, APPENDIX 5
Jean-Michel Maisonneuve, Denis Chauve, and Madelaine Plantec Apr. 1983 178 p Transl. into ENGLISH of "Resultats de Essais de Qualification de la Lampe d'Etalonnage en Vol de la Camera HRV du Projet Spot -- Annexe 5', ONERA, Toulouse Report CERT-1/6038-6-DERO, Nov. 1981
(ESA-TT-796-App-5; CERT-1/6038-6-DERO) Avail: NTIS HC A09/MF A01

Service life, duty cycling in spatial ambient conditions, and irradiation tests were carried out on a standard 20W 12V lamp to be used for calibrating the SPOT satellite photographic equipment. The lamp conforms to specifications except for vibration. The crimping pins in the lamp support must be modified and vibrations which cause the filament to fracture must be filtered. Author (ESA)

N83-28023# Joint Publications Research Service, Arlington, Va.
AEROSPACE PHOTOGRAPHY IN THE SERVICE OF GEOLOGY
V. Volkov *In its* USSR Rept.: Space, No. 21 (JPRS-83430) 9 May 1983 p 112-116 Transl. into ENGLISH from Tekhn. i Vooruzheniye (Moscow), no. 4, Apr. 1982 p 2-3 (For primary document see N83-28011 17-12)
Avail: NTIS HC A07

N83-28036*# Jet Propulsion Lab., California Inst. of Tech., Pasadena. Telecommunications and Data Acquisition Sect.
TECHNIQUES FOR ANALYSIS OF DSN 64-METER ANTENNA AZIMUTH BEARING FILM HEIGHT RECORDS
R. Stevens and C. T. Quach *In its* The Telecommun. and Data Acquisition Rept. 15 May 1983 p 92-118 ref (For primary document see N83-28025 17-12)
Avail: NTIS HC A09/MF A01 CSCL 14E

36 LASERS AND MASERS

Includes parametric amplifiers.

N83-28426 Kansas State Univ., Manhattan.
RAMAN MEASUREMENTS OF LATTICE TEMPERATURE IN SILICON UNDER INTENSE PULSED LASER EXCITATION Ph.D. Thesis
Ho Wai Lo 1982 147 p
Avail: Univ. Microfilms Order No. DA8229189

The lattice temperature rise in crystalline and ion implanted silicon was measured under pulsed laser annealing conditions. A heat probe technique was used. The probe pulse (FWHM 7 nsec, lambda = 405 nm) with variable delay was provided by either a N2 laser-pumped dye laser while the heat pulse was provided by a N2 laser-pumped dye laser (lambda = 485 nm) or by a doubled Nd:YAG laser (FWHM 10 nsec, lambda = 532 nm). Lattice temperatures were inferred directly from the Stokes to anti Stokes count ratio of the one phonon Raman line. Suitable correction factors were applied to the Raman ratio to compensate for the spectral dependence of the Raman cross section and the absorption constant. A new experimental technique which is based on time reversal invariance was developed to find the correction factors. The anomalously low lattice temperatures show unequivocally that the high reflectivity phase is not associated with normal molten silicon unless an unreasonably large cooling rate is assumed. Dissert. Abstr.

N83-28427 Princeton Univ., N. J.
CO2 LASER SCATTERING ON RF WAVES IN ACT-1 Ph.D. Thesis
Glen Anthony Wurden 1982 196 p
Avail: Univ. Microfilms Order No. DA8228184

A radially scanning small angle CO2 laser scattering system was designed and built to study driven radio frequency (RF) waves in the steady state Advanced Concepts Torus (ACT-1). The well characterized multispecies hydrogen plasma (H1(+), H2(+), H3(+)), with low neutral pressure and warm ions, is a convenient medium for the study of finite ion Larmor radius (FLR) effects. Two types of waves, the ion Berstein wave (IBW) and lower hybrid wave (LHW), are investigated. Ion Berstein waves, existing because of the inclusion of FLR terms in the wave dispersion relation, are launched at frequencies below the n(th) ion cyclotron harmonic (f=n omega sub ci/2pi, n=2,3,4) and studied through their density (laser) and potential (probe) fluctuations. Detailed dispersion curves are mapped out, showing the highest harmonic FLR effects yet observed. A new nonintrusive method for measuring hydrogen ion temperature, using externally launched IBW as test waves detected by laser scattering, is demonstrated. Dissert. Abstr.

N83-28428 Admiralty Marine Technology Establishment, Dunfermline (Scotland).
A LASER BASED DISTORTION MEASURING SYSTEM
J. C. Brown Aug. 1982 29 p refs
(AMTE(S)-TM-82450; BR84191) Copyright. Avail: Issuing Activity

A recording system based on a low power laser and electro-optic detector was developed for use in measuring distortions in structures. The system provides an efficient means of measuring and recording deviations from straightness or flatness of structures at 2 cm intervals in lengths of up to 2 m, with an accuracy of 0.5 mm under suitable lighting conditions. Larger structures may be surveyed by measuring individual sections up to 2 m long and using the manual method to define the positions of the corners of these sections and permit the overall shape to be defined. Magnetic tape cartridges produced by the data logger can be read into a minicomputer to provide a graphic representation of the distortions present and to provide input data for structural analysis programs. The system may also be used for recording indentation damage such as in oil rig legs or submarine models and could be used over short arc lengths to provide data for determining deviations from round. Author (ESA)

N83-28429 National Physical Lab., Teddington (England). Div. of Electrical Science.
A THEORETICAL ANALYSIS OF PHOTON DRAG DETECTORS
J. G. Edwards and A. G. Roddie Mar. 1983 48 p refs
(NPL-DES-76; ISSN-0143-7305) Copyright. Avail: Issuing Activity

A theoretical analysis of the spatial response characteristics of photon drag detectors used for the measurement of high power pulses from CO2 lasers is presented. Details of the model and the numerical methods employed are described. Results for several electrode configurations together with a comparison of experimental values obtained for a typical commercial device are given. Electrode configurations which allow flattening of the response and a potentially useful beam alignment method are also derived from the theory. Author (ESA)

N83-28430 National Physical Lab., Teddington (England). Div. of Electrical Science.
TEMPERATURE CONTROL OF AN ACUSTO-OPTIC MODULATOR IN AN ARGON ION LASER USING AN RF SERVO LOOP
J. G. Edwards and D. Henderson Feb. 1983 24 p refs
(NPL-DES-78; ISSN-0143-7305) Copyright. Avail: Issuing Activity

A servo system to control the temperature of the modulator prism for a mode locked argon ion laser is described. The loop uses the phase of the reflected RF power to sense the temperature of the glass prism and controls this temperature via the RF, hence maintaining resonance and allowing full use of the available RF power. A second loop using a thermistor and direct current heaters defends the first against room temperature fluctuations. Author (ESA)

N83-28431# Westinghouse Research and Development Center, Pittsburgh, Pa. Research and Development Center.
ULTRAFINE-GRAINED SUPERCONDUCTORS Final Report, 1 Jan. 1978 - 31 Dec. 1982
M. Ashkin, A. I. Braginski, and J. R. Gavaler 27 Jan. 1983 32 p refs
(Contract F49620-78-C-0031; AF Proj. 2306)
(AD-A125635; Rept-82-9CS-SUPER-B2; AFOSR-83-0100TR) Avail: NTIS HC A03/MF A01 CSCL 20/5

Both A15 and B1 structure superconductors with nearly optimum critical temperatures were prepared with a range of grain sizes down to the coherence length. In B1 compounds high critical current densities at high fields were obtained due to very large critical fields arising from a small column-void microstructure. Critical current data at low fields demonstrated that grain boundaries are not, invariably, efficient pinning sites. Extremely enhanced current densities were measured only in superconductors (B1) whose cross-sectional areas were made similar in size to a single vortex. No increase in critical temperature, which could be attributed to reduced grain sizes, was found. Reversible strain properties of B1 compounds were shown to be superior to those of the A15's. GRA

N83-28432# Cambridge Univ. (England). Dept. of Physical Chemistry.
STUDIES OF ENERGY TRANSFER AND SELECTIVE CHEMICAL REACTION USING TUNABLE IR RADIATION Final Report, 1 Feb. 1977 - 31 Dec. 1981
Ian W. M. Smith Sep. 1982 26 p refs
(Grant AF-AFOSR-3240-77; AF Proj. 2303)

(AD-A125637; AFOSR-83-0063TR) Avail: NTIS HC A03/MF A01 CSCL 20/5

Tunable infrared lasers were used to excite selected vibrational levels of molecules for kinetic studies. It was demonstrated that stimulated electronic Raman scattering (SERS) in Cs vapor provides a useful tunable source between 2.7 and 3.3 micrometers. Later this source was supplanted by an optical parametric oscillator (OPO) supplying high energy pulses (1-5 mJ) over a wider range (1.5-3.6 micrometers). Both sources were used in detailed studies of the relaxation of HCN. When finished these experiments will yield the most complete picture of relaxation rates and pathways in any simple polyatomic molecule. In addition, new direct methods have yielded rates of relaxation of (1) high vibrational levels in HF, and (2) NO and OH in collision with other free radicals. Finally, some preliminary work on selective laser-induced chemistry both in the gas-phase and in low temperature matrices has been carried out. Author (GRA)

N83-28433# Aerospace Corp., El Segundo, Calif. Aerophysics Lab.

HIGH-PERFORMANCE DF-CO2 CHAIN-REACTION LASER Technical Progress Report, 20 Jan. - 10 Feb. 1981

S. T. Amimoto, J. S. Whittier, G. Harper, R. Hofland, Jr., J. M. Walters, Jr., T. A. Barr, Jr., R. L. Kerber, and W. K. Jaul 7 Feb. 1983 27 p refs Prepared in cooperation with the Army Missile Command, Redstone Arsenal, Ala. and Michigan State Univ., East Lansing

(Contract F04701-82-C-0083)

(AD-A125597; SD-TR-83-05; TR-0083(3930-01)-4) Avail: NTIS HC A03/MF A01 CSCL 20/5

Performance of a pulsed DF-CO2, transfer laser was investigated for the case of transverse initiation by a magnetically confined electron beam. Laser output is presented as a function of e-beam charge fluence, O2 concentration, F2 concentration, diluent gas, and total mixture pressure. The experimental data are compared with the predictions of a comprehensive rotational-nonequilibrium DF-CO2 laser model. Experimental results include a 41 J/1 CO2 output at 800 torr cavity pressure and the potential for system electrical efficiency in excess of 100% when the dimension along the axis of e-beam propagation is made comparable to the range of the electron beam. The DF-CO2 laser performance is found to be comparable to that of a DF chain laser using mixtures of comparable chemical energy content. GRA

N83-28434# Naval Postgraduate School, Monterey, Calif. Dept. of Aeronautics.

EFFECTS OF ACOUSTIC INTERFERENCE OF A FLOWING GAS ON ITS ELECTRICAL POWER HANDLING CAPABILITIES M.S. Thesis

Jack W. Tucker Oct. 1982 37 p refs

(AD-A125601) Avail: NTIS HC A03/MF A01 CSCL 20/5

This work explores the feasibility of enhancing the electrical power handling capabilities of a flowing gas by means of acoustically generated disturbances. Air flowing between electrodes, which are mounted perpendicular to the flow, is excited by acoustic drivers, mounted on two sides of a test section, in an attempt to increase the glow-discharge power input to the electrodes prior to breakdown and subsequent arcing. Author (GRA)

N83-28435# Los Alamos Scientific Lab., N. Mex.

MULTIPLE-SHOT ULTRAVIOLET LASER DAMAGE RESISTANCE OF NONQUARTERWAVE REFLECTOR DESIGNS FOR 248 NM

Brian E. Newman, Stephen R. Foltyn, L. John Jolin, and C. K. Carniglia (Optical Coating Lab., Inc.) 1982 20 p refs Presented at the 13th Ann. Boulder Damage Symp., Boulder, Colo., 17 Nov. 1981

(Contract W-7405-eng-36)

(DE82-019578; LA-UR-82-1774; CONF-811117-7) Avail: NTIS HC A02/MF A01

The damage resistance of multilayer dielectric reflectors designed for 248 nm was substantially increased by use of nonquarterwave (QW) thicknesses for the top few layers. The designs minimize the peak standing wave electric field in the high index layers, which are weaker than the low index components. At the ultraviolet wavelength of 248 nm, 99% reflectors of Sc2O3, MgF2, and SiO2 strongly demonstrated the merit of non QW designs. Four sets of reflectors of each of four designs (all QW thickness; one modified pair substitution; two modified pair substitution; one modified pair plus an extra half wave layer of Sc2O3) were tested for damage resistance with a KrF laser operating at 35 pps with a pulse width of 6 ns and spot-size diameter of 0.6 mm. On the average, the reflectors with one modified thickness pair had a 50% higher threshold, than the all quarterwave design. Addition of a second modified layer pair resulted in no further increase in threshold but the saturation fluene was 110% higher. The thresholds correlated best with peak field models, whereas the best model correlating the saturation involved the sum of the upper two scandia layer thickness. DOE

N83-28436# Sandia Labs., Albuquerque, N. Mex. Digital Systems Development Div.

INSTRUCTION MANUAL FOR SANDIA'S LASER TRACKER, VOLUME 2

Kenneth C. Bauhs Jun. 1982 110 p

(Contract DE-AC04-76DP-00789)

(DE82-017781; SAND-80-2049/2) Avail: NTIS HC A06/MF A01

Drawings and information for hardware are reported. Troubleshooting procedures for several systems in the laser tracking facility, and corrections are described. DOE

N83-28437# Los Alamos Scientific Lab., N. Mex.

A STUDY OF DEGENERATE FOUR-WAVE MIXING IN GERMANIUM AND RHENATE-DOPED POTASSIUM CHLORIDE AT CARBON-DIOXIDE-LASER WAVELENGTHS Thesis

David Edward Watkins Feb. 1982 220 p refs

(Contract W-7405-eng-36)

(DE82-011997; LA-9249-T) Avail: NTIS HC A10/MF A01

Theoretical and experimental studies of degenerate four wave mixing by three different mechanisms are presented. These are the nonlinear index of refraction or a lossless, Kerr-like medium, the saturable absorption of a resonant optical transition, and the formation of a free carrier grating. DOE

N83-28438# Los Alamos Scientific Lab., N. Mex. Applied Photochemistry Div.

LASER-BASED INSTRUMENTATION FOR THE DETECTION OF CHEMICAL AGENTS Progress Report, 1 Oct. - 31 Dec. 1981

Mar. 1982 7 p refs

(Contract W-7405-eng-36)

(DE82-013748; LA-9235-PR) Avail: NTIS HC A02/MF A01

Evaluation of the detection of chemical agents and their simulants by synchronous detection of laser-induced flurescence (SDLIF) and laser-induced breakdown spectroscopy (LIBS) continued. The recently completed SDLIF apparatus was tested with a solution of tetracene in benzene. The conventional fluorescence spectrum of tetracene exhibits a bandwidth of approximately 90 nm, whereas the synchronously detected spectrum has a spectral width of only 7 nm. The potential impact of both spontaneous and stimulated Raman scattering on agent detection by SDLIF was investigated. Neither Raman process seemed to impose detection limitations. Extension of the spectral tuning range of the SDLIF system to wavelengths as short as 210 nm was begun. This capability is vital, because the absorption bands of most agents and their simulants are in this portion of the ultraviolet range. Further attempts to use LIBS to detect nascent CN radicals arising from molecules containing this species were unsuccessful. DOE

N83-28439# Bendix Corp., Kansas City, Mo.

LASER FLASH INHIBITOR FOR LASER MONITORING AND CAMERA PROTECTION

R. D. Holt Jul. 1982 18 p ref

(Contract DE-AC04-76DP-00613)

(DE82-016355; BDX-613-2795) Avail: NTIS HC A02/MF A01

A fast electronic shutter was developed, tested, and im-

plemented in a high powered Nd:YAG laser. This system provides ease in visual in-process monitoring and protection for the camera's vidicon tube. The simplicity, ease of operation, and great benefits in process monitoring have made the use of the laser flash inhibitor very successful and significantly improve the capability to use the laser welding system. DOE

N83-28440# Oak Ridge National Lab., Tenn.
DEVELOPMENT OF LASER OPTICALLY PUMPED POLARIZED TARGET FOR USE IN HEAVY-ION PHYSICS
B. Shivakumar, J. R. Beene, C. E. Bemis, Jr., K. A. Erb, J. L. C. Ford, Jr., and D. Shapira 1982 9 p refs Presented at Conf. on Lasers in Nucl. Phys., Oak Ridge, Tenn., 21 Apr. 1982
(Contract W-7405-eng-26)
(DE82-013434; CONF-820428-3) Avail: NTIS HC A02/MF A01

Important micro and macroscopic details of heavy ion reactions may be explicitly determined when nuclear spin aligned (polarized) targets are used. For deformed nuclei, the orientation of the symmetry axis of the nuclear density distribution is determined by the nuclear spin orientation. Polarized targets would thus allow experiments to be performed as a function of the orientation of the symmetry axis of the nuclear density distribution. A polarized target of Eu-151 153 is being developed and is based on laser depopulation optical pumping. A spatially defined target is provided by a supersonic gas jet and consists of Eu atoms seeded into an inert carrier gas. Detailed time dependent optical bumping calculations predict approximately or = to 90% nuclear spin polarization in a Eu target with an expected thickness in excess of 10 to the 15th power atoms/sq cm. Some of the effects that will be observable in heavy ion reactions when deformed polarized targets are used are presented. DOE

N83-28441# Purdue Univ., Lafayette, Ind. Dept. of Chemistry.
REACTIONS OF METAL IONS AND THEIR CLUSTERS IN THE GAS PHASE USING LASER IONIZATION: ION CYCLOTRON RESONANCE SPECTROSCOPY Progress Report, 1 Jul. 1981 - 30 Jun. 1982
B. S. Freiser 1982 26 p refs
(Contract DE-AC02-80ER-10689)
(DE82-009112; DOE/ER-10689/2) Avail: NTIS HC A03/MF A01

Construction of a second ion cyclotron resonance spectrometer was completed, and a state of the art Nicolet Fourier transform mass spectrometer (FTMS) was put into operation. The FTMS is operating well beyond expectations and, together with a Quanta Ray pulsed Nd:YAG laser, has greatly advanced capabilities for studying atomic metal ion chemistry. Of particular note was the demonstration of the capability of FTMS to perform collision induced dissociation. DOE

N83-28442# Mathematical Sciences Northwest, Inc., Bellevue, Wash.
MERCURY EXCIMER STUDIES Final Report
Mar. 1982 67 p refs
(Contract DE-AC06-77DP-40037)
(DE82-012411; MSNWP-1116; QR-11; QR-12; QR-13; QR-14) Avail: NTIS HC A04/MF A01

A multifaceted contract was completed to investigate the potential of several distinct laser media as advanced fusion drivers. The original scope of the program was to investigate metal vapor dimers, in particular Hg2. The conclusions of the mercury excimer studies are summarized, and the technical results achieved in studying XeCl, which was investigated in the second phase of the program. The quarterly progress reporting required for the XeCl part of the program is represented. DOE

N83-28443# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany). Abteilung Lasertechnik.
CONTROLLABLE VARIATION OF THE FOCUS OF A CASSEGRAIN OPTICAL SYSTEM
Friedrich Malota Apr. 1982 34 p refs In GERMAN; ENGLISH summary
(DFVLR-Mitt-82-12) Avail: NTIS HC A03/MF A01; DFVLR, Cologne DM 12,70

A concept which maintains laser focus diameter in spite of the atmospheric influence was developed. A Cassegrain optics transmitter is used. The transmitter optics secondary mirror can be varied along the optical axis. The focus and the variation of its diameter in the case of secondary mirror movement are calculated. A method to determine the focus diameter in practice is given. Author (ESA)

N83-28444# European Space Agency, Paris (France).
DOUBLE FREQUENCY TUNABLE DYE LASER
Yvan Aubry May 1983 41 p refs Transl. into ENGLISH of "Laser a Colorant Bi-Frequence Accordable" rept. CERT-1/6083-3-DERO ONERA, Toulouse, 11 Dec. 1981
(ESA-TT-797; CERT-1/6083-3-DERO) Avail: NTIS HC A03/MF A01

The tunable oscillator part of a pulsed dye laser was modified for emission of two wavelengths. The dye laser, including the oscillator followed by three amplifiers, is pumped by a dual frequency Nd-YAG laser. Tuning along with spectral width are controlled by a holographic network which is connected with a high power telescope. The modified two-wavelength dye laser allows absorption lidar techniques for remote sensing of the atmosphere. Rapid line switching is achieved by electro-optical commutation. Author (ESA)

N83-28445# Physics Lab. RVO-TNO, The Hague (Netherlands). Research Group 1: Physics.
LASER TECHNIQUES FOR REMOTE CROSSWIND SENSING: A LITERATURE STUDY
H. Reinten Dec. 1982 40 p refs
(Contract A78/KL/123)
(PhL-1982-68; TDCK-77308) Avail: NTIS HC A03/MF A01

Laser Doppler velocimetry and laser time of flight velocimetry techniques are reviewed with respect to the requirements for ballistic applications. Experimental results are examined to assess the performance characteristics that may by realized. For long ranges, up to 20 Km, the laser Doppler velocity coherent heterodyne system with a velocity azimuth display scanning technique have the best prospects. Dual beam systems such as the dual beam fringe method or the dual beam single particle time of flight method are only applicable for ranges < 200 m. Author (ESA)

N83-28633# Kalamazoo Coll., Mich. Dept. of Chemistry.
MEASURING THERMAL GRADIENTS IN A MELTING/FREEZING PCM WITH A LASER
Ralph M. Deal and Rene Papo *In* Courtesy Assoc., Inc. Proc. of the DOE Phys. and Chem. Storage Ann. Contractors' Rev. Meeting Dec. 1982 p 465-469 refs (For primary document see N83-28586 17-44)
Avail: NTIS HC A25/MF A01

37 MECHANICAL ENGINEERING

Includes auxiliary systems (non-power); machine elements and processes; and mechanical equipment.

N83-28446 Michigan Univ., Ann Arbor.
ANALYSIS OF HYDROCARBON EMISSIONS FROM CONVENTIONAL SPARK-IGNITION ENGINES Ph.D. Thesis
Wei Shyy 1982 227 p
Avail: Univ. Microfilms Order No. DA8225045

The quench layer on the cylinder wall of a spark ignition engine is modeled for the case where a tangential or swirl velocity exists. Both asymptotic and numerical methods of solution are used. The usual two layer structure is employed for the turbulent boundary layer and Crocco's integral is used to relate the temperature and velocity fields. The quench layer is defined as the region in which the temperature is less than an ignition temperature. In the first analysis only quenching is considered, and it is shown that the resulting concentration of hydrocarbons is much too high compared to experimental results. Next, the model is extended to allow

diffusion, and it is shown that in one stroke time the majority of the mass of unburned mixture in the original quench layer has diffused out and burned. Finally, two means of replenishing the unburned mixture in the quench layer, consisting of the desorbing of fuel from the oil film and outgassing from the first, ring crevice, are included in the model. Dissert. Abstr.

N83-28447 Toledo Univ., Ohio.
INTERFERENCE FITTED ASSEMBLIES USING THE FINITE ELEMENT METHOD Ph.D. Thesis
Byiung Kun Park 1982 217 p
Avail: Univ. Microfilms Order No. DA8228563

Fourier series expansion and the finite element method are used to determine the contact pressure distribution at the mating surfaces between two members assembled together with an initial interference fit. The approach to the solution of this problem involves setting up a Fourier series expansion which represents the contact pressure distribution at the nodal points on the mating surfaces between the two members. The finite element method is then used to determine the resulting displacements and stresses. Results are obtained for the case of a solid shaft shrunk into rectangular, octagonal, sixteen-sided polygonal shaped outside members. The effect of different materials used in combination for the outside member and shaft is investigated. The contact pressure distributions determined by the method in this investigation for compound cylinders are found to be in good agreement with analytical values. Dissert. Abstr.

N83-28448*# General Motors Corp., Indianapolis, Ind.
SMALL GAS TURBINE COMBUSTOR PRIMARY ZONE STUDY Final Report, Sep. 1980 - Dec. 1982
R. E. Sullivan, E. R. Young, G. A. Miles, and J. R. Williams Mar. 1983 208 p refs
(Contract NAS3-22762; DA Proj. 1L1-62209-AH-76)
(NASA-CR-168122; NAS 1.26:168122; DDA-EDR-11170) Avail: NTIS HC A10/MF A01 CSCL 21E

A development process is described which consists of design, fabrication, and preliminary test evaluations of three approaches to internal aerodynamic primary zone flow patterns: (1) conventional double vortex swirl stabilization; (2) reverse flow swirl stabilization; and (3) large single vortex flow system. Each concept incorporates special design features aimed at extending the performance capability of the small engine combustor. Since inherent geometry of these combustors result in small combustion zone height and high surface area to volume ratio, design features focus on internal aerodynamics, fuel placement, and advanced cooling. The combustors are evaluated on a full scale annular combustor rig. A correlation of the primary zone performance with the overall performance is accomplished using three intrusion type gas sampling probes located at the exit of the primary zone section. Empirical and numerical methods are used for designing and predicting the performance of the three combustor concepts and their subsequent modifications. The calibration of analytical procedures with actual test results permits an updating of the analytical design techniques applicable to small reverse flow annular combustors. A.R.H.

N83-28449*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
FILM THICKNESS FOR DIFFERENT REGIMES OF FLUID-FILM LUBRICATION
Bernard J. Hamrock and Duncan Dowson (Leeds Univ.) May 1983 55 p refs
(NASA-TM-81700; E-209; NAS 1.15:81700) Avail: NTIS HC A04/MF A01 CSCL 11H

Mathematical formulas are presented which express the dimensionless minimum film thickness for the four lubrication regimes found in elliptical contacts: isoviscous-rigid regime; piezoviscous-rigid regime; isoviscous-elastic regime; and piezoviscous-elastic regime. The relative importance of pressure on elastic distortion and lubricant viscosity is the factor that distinguishes these regimes for a given conjunction geometry. In addition, these equations were used to develop maps of the lubrication regimes by plotting film thickness contours on a log-log grid of the dimensionless viscosity and elasticity parameters for three values of the ellipticity parameter. These results present a complete theoretical film thickness parameter solution for elliptical contancts in the four lubrication regimes. The results are particularly useful in initial investigations of many practical lubrication problems involving elliptical conjunctions. A.R.H.

N83-28450*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
FULLY PLASMA-SPRAYED COMPLIANT BACKED CERAMIC TURBINE SEAL Patent Application
R. C. Bill and D. W. Wisander, inventors (to NASA) Filed 1 Jun. 1983 8 p
(NASA-Case-LEW-13268-3; US-Patent-Appl-SN-500045) Avail: NTIS HC A02/MF A01 CSCL 11A

This invention is concerned with a seal having a high temperature abradable lining material encircling the tips of turbine blades in turbomachinery. The invention is particularly directed to maintaining the minimum operating clearance between the blade tips and the lining of a high pressure turbine. A low temperature easily decomposable material, such as a polymer, in powder form is blended with a high temperature oxidation resistant metal powder. The two materials are simultaneously deposited on a substrate formed by the turbine casing. Alternately, the polymer powder may be added to the metal powder during plasma spraying. A bond coating is then applied to the metal-polymer composite. A ceramic layer forming a shroud is deposited on the bond coating. The polymer additive mixed with the metal is then completely volatilized to provide a porous layer between the ceramic layer and the substrate. NASA

N83-28451*# Texas A&M Univ., College Station. Dept. of Mechanical Engineering.
DEFINITION OF FORCES ON TURBOMACHINERY ROTORS, TASK A
Dara W. Childs 17 Feb. 1983 83 p refs
(Contract NAS8-34505)
(NASA-CR-170780; NAS 1.26:170780) Avail: NTIS HC A05/MF A01 CSCL 13I

Pump seals, unshrouded turbines, shrouded turbines with tip seals, gas labyrinth seals, gas seals with constant-clearance and convergent-tapes geometries, impelles forces, rolling-element bearings, and spline-interfaces to develop internal rotor damping are addressed. Author

N83-28452*# Cleveland State Univ., Ohio.
DYNAMIC EFFECTS OF INTERNAL SPUR GEAR DRIVES Ph.D. Thesis - Jun. 1982 Final Report
Adam Pintz, R. Kasuba, J. L. Frater, and R. August Washington NASA Jun. 1983 286 p refs
(Grant NAG3-186)
(NASA-CR-3692; NAS 1.26:3692) Avail: NTIS HC A13/MF A01 CSCL 13I

Static analysis, dynamic analysis, and computer programs are discussed. Spur gear formulae and involute profile development and deflection are also discussed. Author

N83-28453*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ELASTOHYDRODYNAMIC CONTACTS. EFFECTS OF DENTS AND GROOVES ON TRACTION AND LOCAL FILM THICKNESS
Lavern D. Wedeven and Cristino Cusano (Illinois Univ., Urbana) Jun. 1983 19 p refs
(NASA-TP-2175; E-1333; NAS 1.60:2175) Avail: NTIS HC A02/MF A01 CSCL 11H

Traction and film thickness were simultaneously measured under sliding elastohydrodynamic (EHD) conditions. The influence of surface topography was investigated by using simulated surfaces produced by depressing dents and grooves in highly polished steel balls. Significant changes in traction occurred depending on the orientation of the surface defects and their location with respect

to the contact region. The results can be explained in terms of changes in overall film thickness and redistribution of pressure within the contact region due to micro-EHD effects. It can be concluded that the traction capability of mechanical components operating in thin film lubrication can be enhanced particularly by surface topographical orientation perpendicular to the surface motion. Associated with the higher traction are increases in local shear stress and normal stress as well as an increase in temperature at asperity sites. It is postulated that the local surface topography can become involved in run in or failure initiation even without actual asperity contact. Author

N83-28454*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
NON-NEWTONIAN FLUID MODEL INCORPORATED INTO ELASTOHYDRODYNAMIC LUBRICATION OF RECTANGULAR CONTACTS
Bo O. Jacobson (Lulea Univ., Sweden) and Bernard J. Hamrock 1983 36 p refs Proposed for presentation at the Joint Lubrication Conf., Hartford, Conn., 18-20 Oct. 1983; sponsored by the AMSE and the American Society of Lubrication Engineers
(NASA-TM-83318; E-1396; NAS 1.15:83318) Avail: NTIS HC A03/MF A01 CSCL 11H

A procedure is outlined for the numerical solution of the complete elastohydrodynamic lubrication of rectangular contacts incorporating a non-Newtonian fluid model. The approach uses a Newtonian model as long as the shear stress is less than a limiting shear stress. If the shear stress exceeds the limiting value, the shear stress is set equal to the limiting value. The numerical solution requires the coupled solution of the pressure, film shape, and fluid rheology equations from the inlet to the outlet. Isothermal and no-side-leakage assumptions were imposed in the analysis. The influence of dimensionless speed, load, materials, and sliding velocity and limiting-shear-strength proportionality constant on dimensionless minimum film thickness was investigated. Fourteen cases were used in obtaining the minimum-film-thickness equation for an elastohydrodynamically lubricated rectangular contact incorporating a non-Newtonian fluid model. Computer plots are also presented that indicate in detail pressure distribution, film shape, shear stress at the surfaces, and flow throughout the conjunction. Author

N83-28455*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ADVANCES IN TRACTION DRIVE TECHNOLOGY
S. H. Loewenthal, N. E. Anderson, and D. A. Rohn 1983 21 p refs Proposed for presentation at the Intern. Off-Highway Meeting and Exposition, Milwaukee, 12-15 Sep. 1983; sponsored by SAE Prepared in cooperation with Army Aviation Research and Development Command, Cleveland
(NASA-TM-83397; E-1674; NAS 1.15:83397; AVRADCOM-TR-83-C-5) Avail: NTIS HC A02/MF A01 CSCL 13I

Traction drives are traced from early uses as main transmissions in automobiles at the turn of the century to modern, high-powered traction drives capable of transmitting hundreds of horsepower. Recent advances in technology are described which enable today's traction drive to be a serious candidate for off-highway vehicles and helicopter applications. Improvements in materials, traction fluids, design techniques, power loss and life prediction methods will be highlighted. Performance characteristics of the Nasvytis fixed-ratio drive are given. Promising future drive applications, such as helicopter main transmissions and servo-control positioning mechanisms are also addressed. Author

N83-28456# Southwest Research Inst., San Antonio, Tex. Energy Systems Research Div.
EFFECT OF LOW-PROOF ALCOHOL UTILIZATION TO SUPPLEMENT DIESEL FUEL ON ENGINE LIFE EXPECTANCY: INTERNATIONAL HARVESTER D436 Final Report
W. E. Likos and C. A. Moses Mar. 1983 51 p refs
(Contract DE-AC19-81BC-10467)
(DE83-006616; DOE/BC-10467-13) Avail: NTIS HC A04/MF A01

A 500 h durability test was conducted to evaluate the effects of using 160 proof ethanol to supplement diesel fuel in a 138 HP diesel engine. The ethanol was sprayed into the intake manifold of the engine at a rate equal to 25% (vol.) of the total fuel flow. Performance testing for power and emissions and pre and postinspections of critical components of the engine confirmed that no significant changes occurred to the engine due to the alcohol fueling. It is concluded that alcohol fumigation does not result in serious wear or durability penalties. DOE

N83-28457# Bendix Corp., Kansas City, Mo.
RADIAL RIVETING OF FLAT-CABLE EYELETS
W. S. McCleave Jun. 1982 15 p
(Contract DE-AC04-76DP-00613)
(DE82-016353; BDX-613-2776) Avail: NTIS HC A02/MF A01

Radial riveting was evaluated to form the eyelets on flexible flat cables. The production process for forming eyelets uses a dual crimp operation which constrains processing and promotes attrition. A radial riveter was purchased for development of eyelet riveting. The radial riveter was found not to be a feasible alternative to the method in production. The major shortcoming of the tool is its inability to provide an intimate contact for laser welding. DOE

N83-28458# General Power Corp., Paoli, Pa.
DOE WAVE-TURBINE-ENGINE DEMONSTRATION Final Report
R. R. Coleman 11 Jun. 1982 24 p refs
(Contract DE-FG05-79ER-10063)
(DE82-018322; DOE/ER-10063/T1) Avail: NTIS HC A02/MF A01

Research on a wave turbine engine, a device which uses energy of vehicle engine exhaust gases to compress the engine inlet air, and which can perform the same function as a conventional turbocharger, is described. A wave turbine engine was designed, built and tested with results that clearly demonstrate: effective wave compression and expansion; and a proportional relationship between fuel flow and shaft horsepower at low speed, under 11,000 rpm. This relationship shows increasing overall efficiency with increased power. This project had demonstrated the potential of the wave engine for a wide range of applications. Significant progress was made to show that this technology is a practical basis for advanced power units with definite advantages over high performance conventional units. DOE

N83-28459# Rensselaer Polytechnic Inst., Troy, N. Y. Dept. of Mechanical Engineering, Aeronautical Engineering and Mechanics.
FUNDAMENTAL RESEARCH ON TRIBOLOGY Final Report, Sep. 1979 - Aug. 1982
Frederick F. Ling Jan. 1983 46 p refs
(Contract DAAG29-79-C-0204)
(AD-A125751; ARO-16254.19-EG) Avail: NTIS HC A03/MF A01 CSCL 07/4

Final report of a three-year project pertaining to fundamental research on tribology is presented. Topics investigated by an interdisciplinary team were: surface mechanics--smooth surfaces; surface mechanics--nonsmooth surfaces; observations of surface deformation and deterioration during sliding; the role of particulates on rolling contact lubrication in the mixed film regime; surface analysis by infrared emission microspectroscopy, laser speckle interferometry and phased-locked interference microscopy; foaming of lubricants due to additives/contaminants; surface reaction kinetics related to wear processes; transport processes in the contact line region; viscoelastic properties of low molecular weight polystyrene solutions; thermal effects in lubricating fluid film; coupled heating and distortion of hydrodynamic films; wear characteristics of composites; wear characteristics of water-lubricated Al2O3 metal sliding couples; fluid motion about a translating particles in a slider bearing. GRA

N83-28460# Volkswagen A.G., Wolfsburg (West Germany). Forschung und Entwicklung.

MATERIAL RESEARCH, MATERIAL DEVELOPMENT AND PROCEDURE DEVELOPMENT FOR CERAMIC GAS TURBINE PARTS Final Report [WERKSTOFFUNTERSUCHUNGEN, WERKSTOFFENTWICKLUNG UND VERFAHRENSENTWICKLUNG FUER KERAMISCHE GASTURBINENBAUTEILLE]
Siebels 19 Aug. 1981 76 p refs In GERMAN
(Contract BMFT-NTS-1006)
(FZL-8110-V/5) Avail: NTIS HC A05/MF A01

Long term stability of silicon nitride and silicon carbide materials, high temperature resistance, ceramic-ceramic and ceramic-metal bonding, and high temperature soldering procedures are described for automobile gas turbine engine applications. Test results show that the use of ceramic materials for static parts is more promising than for rotors. Bonding materials are often deficient.Author (ESA)

N83-28461# Brown, Boveri und Cie, A.G., Mannheim (West Germany). Abt. Technik Gasturbin.
LARGE INDUSTRIAL GAS TURBINE FOR MEDIUM AND PEAK LOAD SERVICE Final Report, Dec. 1980
Christoph Jacobi, Karl-Heinz Schuhmacher, and Hans-Juergen Sponholz Bonn Bundesministerium fuer Forschung und Technologie Feb. 1983 61 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-83-008; ISSN-0340-7608) Avail: NTIS HC A04/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 13

A large, single shaft gas turbine was developed for base load, middle and peak load service, rated at a nominal power of 210 MW and a thermal efficiency of 32%. The design is based on a welded one piece rotor and one large combustion chamber. A substantial rise of the air mass flow is achieved by means of a compressor with transonic relative flow in the first couple of stages. An advanced cooling system is used in two out of three turbine stages, allowing the turbine inlet temperature to be raised. Author (ESA)

N83-28462# European Space Agency, Paris (France).
EXPERIMENTAL INVESTIGATION OF THE INFLUENCE OF THE CASING GEOMETRY ON FLOW AND FLOW-INDUCED NOISE OF A CENTRIFUGAL FAN
Teofani Gikadi Jul. 1982 157 p refs Transl. into ENGLISH of "Experimentelle Untersuchungen zum Einfluss der Gehaeuseform auf die Stroemung u. das Stroemungsgeraeusch eines Radialventilators" rept. DFVLR-FB-81-20 DFVLR, Goettingen, West Germany, Feb. 1981
(ESA-TT-736; DFVLR-FB-81-20) Avail: NTIS HC A08/MF A01; original German version available from DFVLR, Cologne DM 23,30

Beginning with a casingless impeller with 6 backward curved blades, the influence of a small logarithmic volute casing with a cut-off clearance of delta r/R = 0.014 (R = impeller radius) upon the flow through rotating impeller ducts was studied. It is found that there is a blockage of the flow in each impeller duct when passing the cut-off, due to the small cut-off clearance. Optimization of the casing geometry regarding low noise and high fan efficiency leads to a logarithmic spiral with a large cut-off clearance of delta r/R = 0.3. Noise is reduced by 22 dB (A) without loss in fan efficiency. Author (ESA)

N83-28463# Technische Physische Dienst TNO-TH, Delft (Netherlands). Geluid.
STRUCTURE-BORNE SOUND TRANSFER FUNCTIONS OF A PHOENIX MEGIKONE 786027S5 MOUNTING
B. vanderGraaf 2 Sep. 1982 21 p refs
(Contract A69/KM/101)
(TPD-208.900/2; TDCK-77327) Avail: NTIS HC A02/MF A01

The static and dynamic tests on a mounting used for the exhaust silencers connected to the diesel generator sets aboard navy ships are described. Linear and angular acceleration on three axes were measured at frequencies of up to about 1 KHz using an excitation mass of 19 Kg and a blocking mass of 46 Kg. The measured sound transfer functions show no considerable infringements due to a standing wave effect which was to be expected as the dimensions of the rubber element between the two metal shells are small in comparison with the wavelength. However the transfer functions under 500 N static load show stiffening due to standing waves for frequencies over 600 Hz when the mounting is almost unloaded. Author (ESA)

N83-28464# Technische Physische Dienst TNO-TH, Delft (Netherlands).
STRUCTURE-BORNE SOUND TRANSFER FUNCTIONS OF A COMPOUND FLEXIBLE PIPE CONNECTION WITH A 90 DEGREE BEND
B. vanderGraaf 1 Sep. 1982 25 p refs
(Contract A75/KM/008)
(TPD-208.940/3; TDCK-77328) Avail: NTIS HC A02/MF A01

The sound transfer functions of a compound flexible pipe connection with a 90 deg bend were determined using an excitation mass and a seating mass of 20 Kg, and water or air filled bellows. The connection is used for the resiliently mounted diesel engines aboard a minehunter. The results are given as function of the excitation frequency of up to 1 KHz. The analysis of the measured pressure inside the bellows indicates fluid-borne sound transfer predominance. Author (ESA)

N83-28465# Technische Physische Dienst TNO-TH, Delft (Netherlands).
STRUCTURE-BORNE SOUND TRANSFER FUNCTIONS OF A VULKAN EZ 65 S FLEXIBLE SHAFT COUPLING
B. vanderGraaf 26 Feb. 1982 39 p refs
(Contract A76/KM/034)
(TPD-108.920/6) Avail: NTIS HC A03/MF A01

The results of static and dynamic tests on a Vulkan EZ 65 S flexible shaft coupling are presented. Test results are compared with manufacturer's data on this coupling in order to investigate the usefulness of manufacturer's data on stiffness values for the determination of resilient mounting systems for ship machinery. The dynamic to static stiffness ratio is found to be higher than usual for resilient mountings with the same rubber hardness. Static stiffness values for axial and radial directions supplied by the manufacturer are found to be lower than those measured. Use of the manufacturer's data for estimating the stiffness at the acoustic frequencies would lead to an underestimate of 14 db axial, 20 dB radial and 6 dB torsional direction stiffness.
Author (ESA)

N83-28030*# Jet Propulsion Lab., California Inst. of Tech., Pasadena. Ground Antennas and Facilities Engineering Sect.
UNIFIED ANALYSIS FOR ANTENNA POINTING AND STRUCTURAL ERRORS. PART 1. REVIEW
K. Abichandani *In its* The Telecommun. and Data Acquisition Rept. 15 May 1983 p 40-59 refs (For primary document see N83-28025 17-12)
Avail: NTIS HC A09/MF A01 CSCL 13I

38 QUALITY ASSURANCE AND RELIABILITY

Includes product sampling procedures and techniques; and quality control.

N83-28466*# Massachusetts Inst. of Tech., Cambridge. Dept. of Mechanical Engineering.
ULTRASONIC ATTENUATION OF A VOID-CONTAINING MEDIUM FOR VERY LONG WAVELENGTHS Final Report
James H. Williams, Jr., Samson S. Lee, and Hursit Yuece NASA Washington Jun. 1983 22 p refs
(Grant NsG-3210)
(NASA-CR-3693; NAS 1.26:3693) Avail: NTIS HC A02/MF A01 CSCL 14D

Ultrasonic longitudinal through-thickness attenuation in an isotropic medium due to scattering by randomly distributed voids is considered analytically. The attenuation is evaluated on the

assumption of no interaction between voids. The scattered power is assumed to be entirely lost, thus accounting for the ultrasonic attenuation. The scattered power due to the presence of a void is described in terms of the scattering cross section of the void. An exact solution exists for the scattering cross section of a spherical void. An approximate solution for the scattering cross section of an ellipsoidal void is developed based on the so-called Born approximation commonly used in quantum mechanics. This approximate solution is valid for k sub p a sub i < < 1, where k sub p is the wave number of the incident longitudinal wave and a sub i is the largest dimension of the void. It is found that the shape of the void has negligible effect on the scattering cross section and that only the volume of the void is important. Thus, it is noted that in cases where k sup p a sub i < < 1, the exact scattering cross section of a spherical void having the same volume as an arbitrarily shaped void can be used for evaluating ultrasonic attenuation. M.G.

N83-28467# British Library Lending Div., Boston Spa (England).
QUALITY CONTROL OF PRODUCTS IN IRON AND STEEL INDUSTRY
V. P. Perepelkin and V. T. Ababkov 1982 8 p Transl. into ENGLISH from Stal (USSR), v. 3, 1982 p 91-92
(BLL-M-26921-(5828.4)) Avail: British Library Lending Div., Boston Spa, Engl.

An examination is made of the achievements of complex systems of quality control at metallurgical enterprises. The measures planned for improving the quality of products and labor quality and the material encouragement given to workers for achieving such improvement are discussed. The role played by self-financing relations between shops and joint enterprise standards in improving product quality is examined. Extensive training of workers in the functioning of the complex quality control systems is needed for their successful operation. The trends for further improvement of the systems are outlined. Author

N83-28468# Defence Quality Assurance Board, London (England).
SEMINAR ON QUALITY ASSURANCE IN DESIGN AND DEVELOPMENT
1982 53 p Seminar held in London, 24 Mar. 1982
Avail: NTIS HC A04/MF A01

Design control of defense projects, computer aided design techniques for reliability and maintainability, the influence of software on product quality, and configuration management were discussed. For individual titles, see N83-28469 through N83-28472.

N83-28469# Defence Quality Assurance Board, London (England).
DESIGN CONTROL
F. E. Bartholomew (Hunting Engineering Ltd.) *In its* Sem. on Quality Assurance in Design and Develop. 1982 p 5-14 (For primary document see N83-28468 17-38)
Avail: NTIS HC A04/MF A01

The role of a prime contractor in design control is outlined. The organization needed in order to exercise design control, the documentation by which the organization controls the design, the control of subcontractors, and the function of design reviews are discussed. Author (ESA)

N83-28470# British Aerospace Dynamics Group, Stevenage (England). Reliability Technology Dept.
COMPUTER PROGRAMS FOR DESIGN SAFETY, RELIABILITY MAINTAINABILITY ANALYSIS
P. D. T. OConnor *In* Defence Quality Assurance Board Sem. on Quality Assurance in Design and Develop. 1982 p 15-28 (For primary document see N83-28468 17-38)
Avail: NTIS HC A04/MF A01

Reliability prediction using parts count techniques, and non-constant failure rates (Weibull life plot shape parameter, Beta + 1) are considered. For electronic systems, MIL-HBK-217C (Notice 1 May 1980) is used to provide the failure rate models and data base, since it includes stress analysis failure rate models. Failure mode, effect and criticality analysis program in conjunction with MIL-HBK-1629 is discussed. Fault tree analysis and block diagram analysis are treated. Maintainability prediction, based on MIL-HBK-472, is reviewed. Author (ESA)

N83-28471# Defence Quality Assurance Board, London (England).
THE INFLUENCE OF SOFTWARE ON PRODUCT QUALITY
J. M. Ockenden (CAP Scientific Ltd.) *In its* Sem. on Quality Assurance in Design and Develop. 1982 p 29-36 (For primary document see N83-28468 17-38)
Avail: NTIS HC A04/MF A01

Marketing factors which promote high quality software design are outlined, and the benefits for the end product of well designed software are pointed out. Differences between hardware and software which affect quality in design and development are summarized. Author (ESA)

N83-28472# Rolls-Royce Ltd., Derby (England).
CONFIGURATION MANAGEMENT IN PRACTICE
T. W. Crowe *In* Defence Quality Assurance Board Sem. on Quality Assurance in Design and Develop. 1982 p 37-50 (For primary document see N83-28468 17-38)
Avail: NTIS HC A04/MF A01

Configuration management is discussed in relation to the development of Rolls Royce aircraft engines. The physical rather than the functional description of the product is emphasized. The Rolls Royce design scheme is introduced. The scheme is a way of portraying an engineering idea which may affect many items at a less detailed level than is implied by manufacturing detail drawings. The scheme contains sufficient information to provide, when coupled with defined drafting, material, process and other standards, the requisite engineering control over the content of the detail drawing and the parts made to that drawing. Author (ESA)

N83-28473# Jones (J. A.) Applied Research Co., Charlotte, N.C.
EDDY-CURRENT NDE FOR INTERGRANULAR ATTACK Final Report
S. D. Brown Feb. 1983 110 p refs
(EPRI Proj. S201-1)
(DE83-901480; EPRI-NP-2862) Avail: NTIS HC A06/MF A01

The identification of improved eddy current inspection methods for detecting and characterizing intergranular attack in steam generator tubing was studied. Metallographic and eddy current data on 30 removed tubes from three operating plants were reviewed. Intergranular attack was observed in a volumetric form and in a form exhibiting oriented penetrations. The capabilities of various techniques utilized in the field inspections are defined. Eddy current computer modeling techniques are used to develop a basis for estimating the depth of the intergranular attack independent of the resistivity of the attacked region. DOE

N83-28474# Science Applications, Inc., Palo Alto, Calif.
WAMCUTT-II, A FAULT TREE EVALUATION PROGRAM Interim Report
B. Putney, H. R. Kirch, and J. M. Koren Jun. 1982 48 p refs
(EPRI Proj. 1233-1)
(DE82-905298; EPRI-NP-2421) Avail: NTIS HC A03/MF A01

The WAMCUT-II is a new computer code in the WAM family. It finds the minimal cut sets for the top event of a fault tree using a top down algorithm. The code restructures the tree to optimize the Boolean equation. It also removes independent subtrees and solves these separately. DOE

N83-28475# Jones (J. A.) Applied Research Co., Charlotte, N.C.
OPERATION OF EPRI NONDESTRUCTIVE EVALUATION CENTER Annual Report, 1981
T. A. Nemzek, R. M. Stone, F. V. Ammirato, M. Behravesh, S. D. Brown, D. E. MacDonald, G. L. Pherigo, and G. H. Wilson, III Apr. 1982 79 p Sponsored by EPRI
(EPRI Proj.1570-2)
(DE82-903577; EPRI-NP-2332) Avail: NTIS HC A05/MF A01

A dedicated facility for providing field qualified nondestructive evaluation equipment, procedures, and personnel to the utility

industry is discussed. Three main elements are involved: transfer of technology to field use by qualification and refinement of equipment and techniques, training of personnel using realistic samples and mockups under simulated field condition, and encouraging greater involvement of the academic community to provide educational opportunities for NDE careers at all levels.
DOE

N83-28476# Edgerton, Germeshausen and Grier, Inc., Idaho Falls, Idaho.
EVALUATING EMPIRICAL/ANALYTICAL TECHNIQUES TO PREDICT STRUCTURAL INTEGRITY OF PIPE CONTAINING SURFACE FLAWS
W. G. Reuter and W. L. Server 1982 11 p refs Presented at the ASME Pressure Vessel and Piping Conf., Orlando, Fla., 27 Jun. 1982
(Contract DE-AC07-76ID-01570)
(DE82-017267; EGG-M-10482; CONF-820601-19) Avail: NTIS HC A02/MF A01

Data from flat plate specimens containing either triangular, ellipsoidal or rectangular shaped surface flaws were evaluated by several potential analytical techniques. These techniques were modified as needed to predict conditions for initiation of subcritical crack growth, for the defect to penetrate the 6.4 mm (0.25 in.) wall thickness, and for instability (plastic or unstable). The modified analytical techniques developed from the plate specimens were then used to make predictions which are compared with test results obtained from pipe specimens containing triangular shaped surface flaws.
DOE

N83-28477# Sandia Labs., Albuquerque, N. Mex. Acceptance Technoogy Div.
ULTRASONIC MEASUREMENT OF SIMULATED LACK OF PENETRATION IN STAINLESS STEEL GIRTH WELDS: A FEASIBILITY STUDY
G. H. Thomas Apr. 1982 18 p refs
(Contract DE-AC04-76DP-00789)
(DE82-013817; SAND-82-8216) Avail: NTIS HC A02/MF A01

An algorithm for the measurement of lack of penetration in a stainless steel girth weld has been developed and implemented on a computerized ultrasonic test bed facility. This nondestructive inspection technique incorporates signal processing and frequency analysis to measure lack of penetration. The method is semi-automatic: the operator positions the search probe over the weld, the computer acquires and processes the reflected signals, the operator windows out the significant echoes and the computer calculates the depth of lack of penetration. The algorithm has been tested using weld samples with simulated lack of penetrations varying from .090 inch to full penetration. The depth of these EDM slots were ultrasonically measured to an accuracy consistent with the machining process.
DOE

N83-28618# Oak Ridge National Lab., Tenn. Metals and Ceramics Div.
NONDESTRUCTIVE TECHNIQUES FOR FATIGUE DAMAGE DETECTION
W. A. Simpson, Jr. and R. W. McClung *In* Courtesy Assoc., Inc. Proc. of the DOE Phys. and Chem. Storage Ann. Contractors' Rev. Meeting Dec. 1982 p 240-249 (For primary document see N83-28586 17-44)
(Contract W-7405-eng-26)
Avail: NTIS HC A25/MF A01

39 STRUCTURAL MECHANICS

Includes structural element design and weight analysis; fatigue; and thermal stress.

For applications see *05 Aircraft Design, Testing and Performance* and *18 Spacecraft Design, Testing and Performance.*

N83-28478 Northwestern Univ., Evanston, Ill.
NON-HERTZIAN NORMAL AND TANGENTIAL LOADING OF ELASTIC BODIES IN CONTACT Ph.D. Thesis
Nasser Ahmadi 1982 305 p
Avail: Univ. Microfilms Order No. DA8225867

A general method of numerical solution in the non-Hertzian elastic contact problem for frictionless and sliding cases is developed using rectangular subdivisions with constant or paraboloidal pressure variation. The Boussinesq and Cerruti force displacement relationships for the normal and shear loads are considered in case of partial slip, the tangential load is not sufficient to cause sliding over the entire contact region so that the portion of the contact sticks while the reminder slips. The two bodies can have different geometrical and elastic properties; also their principal axes in the common tangential plane may be misaligned. The major application of method given is in the sliding contact of short rough cylinder with an elastic half space; the contact region is the side of cylinder, whose axis may not be exactly aligned to the surface of half space.
Dissert. Abstr.

N83-28479 Northwestern Univ., Evanston, Ill.
MECHANICAL PROPERTIES OF COMPOSITION MODULATED COPPER-PALLADIUM FOILS Ph.D. Thesis
Hideo Itozaki 1982 126 p
Avail: Univ. Microfilms Order No. DA8225943

The mechanical properties of composition modulated Cu-Pd foils were investigated using a bulge test. Composition modulated foils were made by alternately evaporating copper and palladium on a heated mica substrate. Transmission Laue patterns showed that foils had grown in two orientations, both of which were closed packaged directions aligned on the mica substrate. The boundaries of the two orientations were double positioning boundaries. The structure of the specimen was determined by X-ray diffraction. Wavelengths of the composition modulation of specimens were 1.5 to 3.2 nm. First, the elastic properties of the foils were investigated. Foils were mounted after releasing the foils from the mica substrate. Thus, the residual stress between the foil and the substrate was released and the mounted foil had no tensions but was wrinkled. An analysis is therefore given for the determination of the initial deflection of the bulge for a wrinkler foil.
Dissert. Abstr.

N83-28480 Texas Univ., Arlington.
THE VIBRATIONAL CHARACTERISTICS OF UNIFORM BARS CONTAINING A SYMMETRIC DISCONTINUITY IN STIFFNESS APPLIED TO STRUCTURAL INTEGRITY MONITORING Ph.D. Thesis
William Thomas Springer 1982 250 p
Avail: Univ. Microfilms Order No. DA8227450

Closed form eigenvalue expressions were developed for both the longitudinal and transverse vibration of uniform bars containing a symmetric discontinuity in cross-sectional area. Both of these expressions were generated using three receptance elements to model the bar, and were developed without regard to boundary conditions. These genral expressions were then applied to the specific problems of the longitudinal vibration of a free tree beam, and the transverse vibration of a fixed free beam. In both cases, the structural frequency response function was used to experimentally determine the natural frequencies. The feasibility of using the structural frequency response function to experimentally determine the natural frequencies. The feasibility of using the structual frequency response function to monitor healing in fractured long bones and to predict damage magnitude in aircraft bolts was established.
Dissert. Abstr.

N83-28481 Texas Univ., Austin.
RIGID PAVEMENT NETWORK REHABILITATION SCHEDULING USING DISTRESS QUANTITIES Ph.D. Thesis
Manuel GutierrezDeVelasco 1982 248 p
Avail: Univ. Microfilms Order No. DA8227657

The development and application of a scheme, in the form of a computer program, to prioritize and schedule a set of rigid

pavements for rehabilitation within a specified time frame and budget constraints was presented. The program is intended to provide highway agencies with guidelines to generate decision elements for the management of their road maintenance funds. The prioritization and scheduling scheme is based on distress quantities; it makes use of distress indices and distress prediction equations. These equations are an important part of the scheme, and therefore a detailed description is given of its derivation. The immediate aplication of the computer program is to generate lists of candidate pavements for rehabilitation. However, the use of the program is extended to analyze the effect of several different budget policies on the condition of the pavement network.

Dissert. Abstr.

N83-28482 Texas Univ., Austin.
FLEXURAL FATIGUE BEHAVIOR OF STEEL FIBER REINFORCED CONCRETE Ph.D. Thesis
Mahmoud Rida Galhoud 1982 281 p
Avail: Univ. Microfilms Order No. DA8227648

The effect of repeated loading on the mechanical properties and flexural behavior of concrete reinforced with short pieces of randomly distributed steel fibers was studied. A fitigue testing program was conducted using seventy-two 6-in, x 6-in, x 36-in, beams, divided into six series. The beams were loaded at third points having a tota! clear span of thirty inches. A total of six batches of concrete, two at each of three different nominal compressive strength levels, were used, 300, 4500, and 6000 psi. Dramix steel fibers with hooked ends, with a length of 50 mm and a diameter of 0.5 mm, were used in two different contents, 0.75 and 1.5 percent by volume, for each strength concrete. Tests were conducted at a loading rte of five cycles per second at a stress ratio (the minimum to the maximum stress) of 0.1.

Dissert. Abstr.

N83-28483# British Library Lending Div., Boston Spa (England).
CALCULATION OF STRESSES IN RELATION TO THE KINEMATICS OF FLOW WITH TWO-DIMENSIONAL DEFORMATION
P. D. Chudkaov 1982 3 p Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Chernaya Met. (USSR), v. 3, 1982 p 152-153
(BLL-M-26742-(5828.4)) Avail: British Library Lending Div., Boston Spa, Engl.

Equilibrium equations are presented to ascertain the average stress. An equation is also given to determine when the condition of consistency or compatibility is not observed. Formulae are given for determining the normal and tangential stresses at the contact surface.

Author

N83-28484 Georgia Inst. of Tech., Atlanta.
FREE VIBRATION ANALYSIS OF LAYERED PLATES AND COMPOSITES BY A MIXED METHOD: STATE PLACE APPROACH Ph.D. Thesis
S. Chandrashekara 1982 237 p
Avail: Univ. Microfilms Order No. DA8229886

A mixed method of elastodynamics is presented for analyzing the dynamic response of laminated plates and composites. The State Space method of analysis is used to reduce the governing three dimensional equations of motion to a set of two dimensional equations while keeping the field equations in their exact form. The method was aplied to the solution of natural frequencies for two layered isotropic plates with various ratios of layer thicknesses and several cases of two layered orthotropic plates with varying degrees of orthotropy of individual layers. To compare the results from this method with those obtained by solving the exact elasticity equations, the plates wee assumed to be in a state of plane strain. Comparisons also were made with other approximate theories with and without shear deformation and rotary inertia corrections.

Dissert. Abstr.

N83-28485 Texas Univ., Austin.
LINEAR STRUCTURAL RESPONSES TO EVOLUTIONARY RANDOM LOADS Ph.D. Thesis
George Panayiotou Solomons 1982 168 p
Avail: Univ. Microfilms Order No. DA8227724

The statistics of the motion of a lightly damped linear simple degree of freedom oscillator is investigated. The oscillator is driven by a nonstationary excitation possessing a broad band evolutionary power spectrum. Based on the assumption of light damping, the equations of motion for the amplitude and phase are averaged. The equations which are derived by this procedure allow the modeling of certain response parameters as Markov processes; associated with this modeling is the Fokker-Planck equation governing the evolution of the probabilistic structure of the Markov process. The Fokker-Planck equation is solved analytically for the transition probability density function of the amplitude, and the solution is expressed in terms of readily identifiable parameters. The Fokker-Planck equation associated with the two dimensional process of displacement and velocity is also solved analytically. The joint and marginal distributions of these variables are presented. Statistics of the response phase and energy are derived. The question of structural reliability under evolutionary excitation is addressed. Several approximate methods associated with amplitude or displacement barrier crossings are applied.

Dissert. Abstr.

N83-28486 Cornell Univ., New York.
AXISYMMETRIC VISCOPLASTIC DEFORMATION BY THE BOUNDARY ELEMENT METHOD Ph.D. Thesis
Vijay Sarihan 1982 114 p
Avail: Univ. Microfilms Order No. DA8228468

A boundary element formulation and numerical implementation of the problem of small axisymmetric deformation of visco-plastio bodies was presented. While the extension from planar to axisymmetric problems is carried out fairly simply for the finite element method (FEM), this is far from true for the boundary element metod (BEM). The primary reason for this fact is that the axisymmetric kernels in the integral equation of the BEM contain elliptic functions which cannot be integrated analytically even over boundary elements and internal cells of simple shape. Thus, special methods were developed for the efficient and accurate numerical integration of these singular and sensitive kernels over discrete elements. The accurate determination of stress rates by differentiation of the displacement rates presents another formidable challenge.

Dissert. Abstr.

N83-28487 California Univ., Santa Barbara.
CONSISTENT MASS INVESTIGATION OF THE COUPLED FLEXURE TORSION VIBRATION OF BEAMS Ph.D. Thesis
Mehran Mobrem 1982 118 p
Avail: Univ. Microfilms Order No. DA8224647

The coupled natural frequencies of a beam for bending and torsion by consistent mass (matrix) method are analyzed. For a beam of nonsymmetrical cross section in which the shear center and mass center axes do not coincide, these coupled natural frequencies would occur. The most general case is when the coordinate at the shear center parallel to centroidal principle axes does not pass through the mass center. In that case the triple coupling between two bending and torsional natural frequencies would take place. If there is one axis of symmetry in which one of the coordinates at the shear center parallel to centriodal principle axis would pass through the mass center, then there is only double coupling between one bending and torsional natural frequencies and one independent bending natural frequency. A series of computer programs were written to solve the problem by the consistent mass method, finite difference method and also by a lumped mass method.

Disert. Abstr.

N83-28488 Virginia Univ., Charlottesville.
OPTIMAL PASSIVE FREQUENCY RESPONSE CONTROL OF LARGE VIBRATING SYSTEMS Ph.D. Thesis
Levent Kitis 1982 104 p
Avail: Univ. Microfilms Order No. DA8228609

Computational frequency response optimization methods for complex vibrating systems are developed using passive control techniques. Methods suitable for discrete systems with a large number of degrees of freedom are applied to obtain optimal

broadband response. Reanalysis and modal techniques are used in the structural dynamic analysis phase of the design algorithm and optimization is carried out by a feasible directions approach. The optimal design algorithm is illustrated by several examples in which design goals are achieved either by system modification or by appending absorber systems to the main structure.
Dissert. Abstr.

N83-28489# Army Materials and Mechanics Research Center, Watertown, Mass.
SUPPLEMENT TO THE PROCEEDINGS OF THE ARMY SYMPOSIUM ON SOLID MECHANICS, 1982: CRITICAL MECHANICS PROBLEMS IN SYSTEMS DESIGN Final Report
Sep. 1982 26 p refs Symp. held in Cape Cod, Mass., 21-23 Sep. 1982
(AD-A119498; AMMRC-MS-82-4-Suppl) Avail: NTIS HC A03/MF A01 CSCL 20/11

Design and testing of a prototype blast shelter is described. For individual titles, see N83-28490 through N83-28490.

N83-28490# Kaman Avidyne, Burlington, Mass.
BLAST RESPONSE OF A HARDENED ARMY ISO SHELTER
Roger W. Milligan, Allen Lush, and William L. Crenshaw (Army Natick Research and Development Labs.) *In* AMMRC Suppl. to the Proc. of the Army Symp. on Solid Mech., 1982: Critical Mech. Probl. in Systems Design Sep. 1982 p 43-65 refs (For primary document see N83-28489 17-39)
Avail: NTIS HC A03/MF A01 CSCL 20/11

A prototype shelter was designed to withstand a blast loading corresponding to a 10.0 psi (68.9 kPa) incident overpressure. The hardened shelter was then constructed, instrumented and subjected to a simulated nuclear blast loading. Test results demonstrated that a design featuring shear stiffened sandwich panels with aluminum face materials could withstand a nominal 10.0 psi incident shock loading. Author

N83-28491*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
VIBRATION CHARACTERISTICS OF A DEPLOYABLE CONTROLLABLE-GEOMETRY TRUSS BOOM
John T. Dorsey Jun. 1983 30 p refs
(NASA-TP-2160; L-15580; NAS 1.60:2160) Avail: NTIS HC A03/MF A01 CSCL 20K

An analytical study was made to evaluate changes in the fundamental frequency of a two dimensional cantilevered truss boom at various stages of deployment. The truss could be axially deployed or retracted and undergo a variety of controlled geometry changes by shortening or lengthening the telescoping diagonal members in each bay. Both untapered and tapered versions of the truss boom were modeled and analyzed by using the finite element method. Large reductions in fundamental frequency occurred for both the untapered and tapered trusses when they were uniformly retracted or maneuvered laterally from their fully deployed position. These frequency reductions can be minimized, however, if truss geometries are selected which maintain cantilever root stiffness during truss maneuvers. Author

N83-28492# Laboratorio de Acustica e Sonica, Sao Paulo (Brazil).
OVERALL MEASUREMENT OF VIBRATION LEVELS, PERCENT BANDWIDTH ANALYSIS AND FFT DIGITAL ANALYSIS COMPLETING DIAGNOSIS OF DEFECTS IN COMPRESSOR GROUP INSTALLED IN CARAIBA METAIS
L. X. Nepomuceno, J. J. Spindola, and A. Lenzi 10 May 1983 74 p In PORTUGUESE; ENGLISH summary Original contains color illustrations
(Rept-1503/83) Avail: NTIS HC A04/MF A01

The procedures, instruments, and the results of a complete vibration analysis (overall levels, percent bandwidth analysis, Digital FFT analysis in the three axles) of a set of electric motor/hydraulic coupler/gear multiplier/compressor are described. Author

N83-28493*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
CONSTITUTIVE RELATIONSHIPS FOR ANISOTROPIC HIGH-TEMPERATURE ALLOYS
D. N. Robinson [1982] 22 p refs Prepared for Presentation at the Intern. Post-Conf. Seminar on Inelastic Analysis and Life Prediction, Chicago, 29-30 Aug. 1983; sponsored by Commission of European Communities and Argonne Natl. Lab., Chicago
(NASA-TM-83437; E-1733; NAS 1.15:83437) Avail: NTIS HC A02/MF A01 CSCL 20K

A constitutive theory is presented for representing the anisotropic viscoplastic behavior of high temperature alloys that posses directional properties resulting from controlled grain growth or solidification. The theory is an extension of a viscoplastic model that was applied in structural analyses involving isotropic metals. Anisotropy is introduced through the definition of a vector field that identifies a preferential (solidification) direction at each material point. Following the development of a full multiaxial theory, application is made to homogeneously stressed elements in pure shear and to a uniaxially stressed rectangular block in plane stress with the stress direction oriented at an arbitrary angle with the material direction. It is shown that an additional material parameter introduced to characterize the degree of anisotropy can be determined on the basis of simple creep tests. S.L.

N83-28494# New Mexico Univ., Albuquerque. Bureau of Engineering Research.
DIAGNOSIS OF FRACTURE DAMAGE IN SIMPLE STRUCTURES: A MODAL METHOD
Frederick D. Ju, Mehmet Akgun, Thomas L. Paez, and Eric T. Wong Oct. 1982 58 p refs
(Grant AF-AFOSR-0086-81)
(AD-A125714; CE-62(82)AFOSR-993-1; AFOSR-83-0049TR) Avail: NTIS HC A04/MF A01 CSCL 05/9

The present paper explores a method to locate fracture damage in a structure, and to estimate the intensity of the damage. It is noted that when fracture damage occurs in a structure, the modal frequencies of the damaged structure will shift. The perturbations in individual modal frequencies are governed uniquely by the intensity of the damage and its location in the structure. Consequently, when the frequency spectrum of an unflawed structure is available, field measurement of the structural response after a major event could lead to an estimate of intensity and location of its damage. The existence of a crack renders an overall softening effect in the compliance of the structure. The reduction in stiffness can be quantified by the location and the intensity of the crack. With such a model, the diagnosis of the fracture damage is fundamentally a structural identification. GRA

N83-28495# Sandia Labs., Albuquerque, N. Mex.
FATIGUE AND CREEP-FATIGUE TESTING OF STEAM FILLED TUBULAR ALLOY 800 SPECIMENS
Wendell B. Jones and J. A. VanDenAvyle May 1982 49 p refs ;Contract DE-AC04-76DP-00789)
(DE82-019220; SAND-82-0850) Avail: NTIS HC A03/MF A01

A test program was conducted to investigate water/steam effects on elevated temperature low cycle fatigue and creep fatigue of Alloy 800. The test results are interpreted and analyzed. Tubular specimens with water sealed inside were cycled to failure under strain control. Tests were conducted to 616K (650 F) and 922K (1200 F); some at 922K included tensile or compressive hold periods to simulate creep fatigue conditions. The tubular specimens showed significantly lower lives than solid bar specimens cycled at equivalent strain ranges. Rough internal surfaces contributed to early crack initiation with these specimens. Inclusion of hold periods caused further large reductions in cycles to failure. DOE

N83-28496# Los Alamos Scientific Lab., N. Mex.
DEVELOPMENT OF THE FREELY EXPANDING RING TEST FOR MEASURING DYNAMIC MATERIAL PROPERTIES
R. H. Warnes, R. R. Karpp, T. A. Duffey, and J. D. Jacobson 1982 7 p refs Presented at Joint Conf. on Expt. Mech., Honolulu, Hawaii, 22 May 1982
(Contract W-7405-eng-36)
(DE82-008122; LA-UR-82-345; CONF-820516-8) Avail: NTIS

HC A02/MF A01

Modifications to the freely expanding ring test for eliminating adverse two dimensional effects are described and illustrated. The result is to substantially increase the strain rate range over which dynamic material property data can be reliably obtained. Several different ring launching schemes are discussed, and data are presented that were taken with a particular shockless electromagnetic system. Results from initial attempts at measuring dynamic compressive properties with a contracting ring are presented. DOE

N83-28497# Los Alamos Scientific Lab., N. Mex.
NUMERICAL SIMULATION OF FRACTURE
L. G. Margolin and T. F. Adams 1982 9 p refs Presented at 23rd Symp. on Rock Mech., Berkeley, Calif., 25 Aug. 1982
(Contract W-7405-eng-36)
(DE82-014050; LA-UR-82-1156; CONF-820803-8) Avail: NTIS HC A02/MF A01

The Bedded Crack Model (BCM) is a constitutive model for brittle materials. It is based on effective modulus theory and makes use of a generalized Griffith criterion for crack growth. It is used in a solid dynamic computer code to simulate stress wave propagation and fracture in rock. A general description of the model is given and then the theoretical basis for it is presented. Some effects of finite cell size in numerical simulations are discussed. The use of the BCM is illustrated in simulation of explosive fracture of oil shale. There is generally good agreement between the calculations and data from field experiments. DOE

N83-28498# Oak Ridge National Lab., Tenn. Solid State Div.
DIRECT OBSERVATIONS CRACK-TIP DISLOCATION BEHAVIOR DURING TENSILE AND CYCLIC DEFORMATION
S. M. Ohr, J. A. Horton, and S. J. Chang (Union Carbide Corp.) 1982 14 p refs Presented at the 2nd Intern. Symp. on Defects, Fracture and Fatigue, Quebec, Canada, 30 May 1982
(Contract W-7405-eng-26)
(DE82-017496; CONF-8205104-1) Avail: NTIS HC A02/MF A01

Direct observations were made of the emission and distribution of dislocations at the crack tip of propagating cracks in various metals during tensile and cyclic deformation in an electron microscope. The results show a number of findings regarding the dislocation behavior near the crack tip and its relationship to the propagation of cracks. Depending on the loading geometry, it was possible to observe the propagation of shear cracks of mode 3 type as well as tensile cracks of mode 1 type. Some of the observations were made using a video recording system. For shear cracks of mode 3 type, the crack tip generated crew dislocations on planes which were coplanar with the cracks. The dislocations were generally in the form of an inverse pileup but a dislocation free zone was present near the crack tip. For tensile cracks of mode 1 type, edge dislocations were generated at the crack tip on planes which were inclined to crack. As the dislocation were emitted, the crack tip was blunted and crack propagation ceased. DOE

N83-28499# Sandia Labs., Albuquerque, N. Mex.
ANALYTICAL FREQUENCY-RESPONSE FUNCTIONS FOR A STRUCTURAL SYSTEM
Ronald Rodeman, Clifton F. Briner, and Mathias J. Sagartz 1982 3 p Presented at the 9th US Natl. Congr. of Applied Mech., Ithaca, N.Y., 21 Jun. 1982
(Contract DE-AC04-76DP-00789)
(DE82-011028; SAND-82-0256C; CONF-820614-1) Avail: NTIS HC A02/MF A01

A technique is presented where frequency response functions for reasonable complex structures can be found in an expensive and timely manner. Once these functions are obtained, the response to a arbitrary stationary random or transient excitation with the specified spatial distribution may be found. The structural system that is studied is a thin, linear viscoelastic, circular cylindrical shell with an internal structural subsystem. Frequency responses are obtained for two separate loadings. One of these is an axisymmetric pressure loading derived from an acoustic environment; the other a forced base motion obtained from a mechanical vibration environment. The method of receptance is used to determine the total system frequency response from a knowledge of the component frequency response functions. DOE

N83-28500# California Univ., Livermore. Lawrence Livermore Lab. Mechanical Engineering Dept.
INTRODUCTION TO STRUCTURAL DYNAMICS WITH APPLICATIONS
D. W. Coats, R. C. Murray, and T. A. Nelson May 1982 150 p refs
(Contract W-7405-eng-48)
(UCID-19408) Avail: NTIS HC A07/MF A01

The basic principles used in dynamic analysis of structures are developed. The topics covered range from free vibration of single degree of freedom systems to forced vibration response of multidegree of freedom systems. Example problems are presented to illustrate various solution techniques and show how they may be applied to practical problems. The text is made to accompany a course in structural dynamics. DOE

N83-28501# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany). Abteilung Strukturberechnung.
ON THE FAIL-SAFE CHARACTERISTICS OF STIFFENED PANELS
Jun-Yang Wang and Fu-Mei Liu Nov. 1982 67 p refs
(DFVLR-FB-83-08) Avail: NTIS HC A04/MF A01; DFVLR, Cologne DM 24,20

Residual strength crack growth rate of riveted, stiffened panels are evaluated. The method is based on the fail-safe characteristics of stiffened panels and on the material R-curves. These data, obtained in tests, are used to calculate the fracture characteristics and the residual life of the Y-10 wing lower stiffened panel. The plastic material behavior of the sheet, rivets, and stringers are considered. Computational results and corresponding tests are in good agreement. Author (ESA)

N83-28502# California Univ., Berkeley. Center for Earthquake Engineering Research.
MODEL STUDY OF EFFECTS OF DAMAGE ON THE VIBRATION PROPERTIES OF STEEL OFFSHORE PLATFORMS
F. Shahrivar and Jack G. Bouwkamp Jun. 1982 216 p refs
(Grant NSF PFR-79-08257)
(PB83-148742; UCB/EERC-82/05; NSF/CEE-82012) Avail: NTIS HC A10/MF A01 CSCL 13B

The selected vibration properties of an offshore platform model were studied considering both damaged and undamaged conditions. The platform model was a 1/50th scale, three dimensional tower possessing the key features of a typical, eight legged, k braced steel offshore platform. Changes in the vibration frequencies and mode shapes of fixed offshore, platforms can be used to detect damage. Quantitative information on mode shapes was utilized leading to improved damage detection capabilities. The scaling considerations, the model and the experimental method are described. The experimental results are complemented with analytical results and show excellent correlation. In general, emphasis is placed on the vibration frequencies and deck modal displacements of the first two translational modes and the first torsional mode. GRA

N83-28622# Union Carbide Corp., Oak Ridge, Tenn. Nuclear Div.
ROTOR TESTING IN FY 1982
E. F. Babelay, Jr. *In* Courtesy Assoc., Inc. Proc. of the DOE Phys. and Chem. Storage Ann. Contractors' Rev. Meeting Dec. 1982 p 270-278 refs (For primary document see N83-28586 17-44)
(Contract W-7405-eng-26)
Avail: NTIS HC A25/MF A01

N83-28035*# Jet Propulsion Lab., California Inst. of Tech., Pasadena. Ground Antennas and Facilities Engineering Sect.
EVALUATION OF ANTENNA FOUNDATION ELASTIC MODULUS

H. McGinness and G. Anderson *In its* The Telecommun. and Data Acquisition Rept. 15 May 1983 p 89-91 (For primary document see N83-28025 17-12)
Avail: NTIS HC A09/MF A01 CSCL 20K

42 GEOSCIENCES (GENERAL)

No abstracts in this category.

43 EARTH RESOURCES

Includes remote sensing of earth resources by aircraft and spacecraft; photogrammetry; and aerial photography.

For instrumentation see *35 Instrumentation and Photography.*

N83-28503 Michigan Univ., Ann Arbor.
POSTGLACIAL VEGETATION OF EASTERN UPPER MICHIGAN, VOLUMES 1 AND 2 Ph.D. Thesis
Richard Paul Futyma 1982 495 p
Avail: Univ. Microfilms Order No. DA8224952

The postglacial vegetational history of Chippewa, Luce, and Mackinac counties, Michigan, was studied through stratigraphic analysis of fossil pollen in sediments from ten lake and bog sites. This region of ca. 6000 sq km is bounded by Lakes Superior, Michigan, and Huron; its surface varies from flat to rolling and is covered by a veneer of sandy glacial drift and lacustrine deposits. A mosaic of hardwood forests, pine forests, and extensive bogs and conifer swamps comprises the present vegetation. The general sequence of events interpreted from the pollen stratigraphies is as follows: (1) Late-glacial and early holocene forests were dominated by jack pine (Pinus banksiana) and spruce (Picea). (2) Between 8000 and 5000 years ago (Hypsithermal period) the forests were dominated by white pine (Pinus strobus) or mixtures of white pine, jack pine, and red pine (P. resinosa). (3) Starting about 5000 years ago, hardware trees such as birch (Betula) and sugar maple (Acer saccharum) became more abundant, and dominant in places. Widespread development of bogs and other peatlands began at this time. Dissert. Abstr.

N83-28504*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
AGRISTARS: AGRICULTURE AND RESOURCES INVENTORY SURVEYS THROUGH AEROSPACE REMOTE SENSING, RESEARCH REPORT, FISCAL YEAR 1982
Jan. 1983 85 p Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and Agency for International Development Original contains color imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198 ERTS
(Proj. AgRISTARS)
(E83-10318; NASA-TM-85250; AP-J2-0393; NAS 1.15:85250)
Avail: NTIS HC A05/MF A01 CSCL 02C

An introduction to the overall AgRISTARS program is presented along with a general statement on progress, and separate summaries of the activities of each of the eight projects. Emphasis is on technical highlights. Organizational and management information on AgRISTARS is included along with a complete bibliography of publications and reports. A.R.H.

N83-28505*# Soil Conservation Service, Washington, D. C.
SOIL MOISTURE PROJECT EVALUATION WORKSHOP
Richard H. Gilbert, ed. Nov. 1980 184 p refs Workshop held at Beltsville Agricultural Research Center, Md., 16-17 Jun. 1980 Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and Agency for International Development ERTS
(Proj. AgRISTARS)
(E83-10322; NASA-CR-170364; SM-R0-04016; NAS 1.26:170364)
Avail: NTIS HC A09/MF A01 CSCL 02C

Approaches planned or being developed for measuring and modeling soil moisture parameters are discussed. Topics cover analysis of spatial variability of soil moisture as a function of terrain; the value of soil moisture information in developing stream flow data; energy/scene interactions; applications of satellite data; verifying soil water budget models; soil water profile/soil temperature profile models; soil moisture sensitivity analysis; combinations of the thermal model and microwave; determing planetary roughness and field roughness; how crust or a soil layer effects microwave return; truck radar; and truck/aircraft radar comparison. A.R.H.

N83-28506*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE MULTISPECTRAL IMAGING SCIENCE WORKING GROUP. VOLUME 3: APPENDICES Final Report
Scott C. Cox, ed. 1 Sep. 1982 299 p refs Proc. of working groups held in Pasadena, Calif. and in Silver Spring, Md., 1982; sponsored by NASA, Washington Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198 ERTS
(E83-10351; NASA-CP-2260; NAS 1.55:2260) Avail: NTIS HC A13/MF A01 CSCL 20F

The status and technology requirements for using multispectral sensor imagery in geographic, hydrologic, and geologic applications are examined. Critical issues in image and information science are identified. For individual titles, see N83-28507 through N83-28549.

N83-28507*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
BOTANICAL SCIENCES TEAM
C. J. Tucker *In its* The Multispectral Imaging Science Working Group, Vol. 3 1 Sep. 1982 14 p Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198 ERTS (For primary document see N83-28506 17-43)
Avail: NTIS HC A13/MF A01 CSCL 06C

The orbital ability to remotely sense vegetated targets can be improved by increased understanding of atmospheric effects, and by the use of appropriate spatial resolution, narrow spectral bandwidths, additional spectral bands, and a temporal frequency of 2 to 3 days. The effects of atmosphere on radiative transfer, remote sensing over a nonuniform surface, the choice of the red and photographic IR portions of the spectra for delinating botanical features, and areas where additional research is needed are covered. A.R.H.

N83-28508*# National Aeronautics and Space Administration, Washington, D. C.
GEOLOGY TEAM
In NASA. Goddard Space Flight Center The Multispectral Imaging Science Working Group, Vol. 3 1 Sep. 1982 7 p ERTS (For primary document see N83-28506 17-43)
Avail: NTIS HC A13/MF A01 CSCL 08G

Evaluating of the combined utility of narrowband and multispectral imaging in both the infrared and visible for the lithologic identification of geologic materials, and of the combined utility of multispectral imaging in the visible and infrared for lithologic mapping on a global bases are near term recommendations for future imaging capabilities. Long term recommendations include laboratory research into methods of field sampling and theoretical models of microscale mixing. The utility of improved spatial and spectral resolutions and radiometric sensitivity is also suggested for the long term. Geobotanical remote sensing research should be conducted to (1) separate geological and botanical spectral signatures in individual picture elements; (2) study geobotanical correlations that more fully simulate natural conditions; and use

test sites designed to test specific geobotanical hypotheses. A.R.H.

N83-28509*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
GEOGRAPHIC SCIENCE TEAM
Nevin Bryant *In its* The Multispectral Imaging Science Working Group, Vol. 3 1 Sep. 1982 24 p ERTS (For primary document see N83-28506 17-43)
Avail: NTIS HC A13/MF A01 CSCL 08F

The rational for using remote sensing in land use/land cover, geomorphology, and cartography applications is stated as well as potential uses in each of these areas. The next step to be perfected is indicated. Spatial and spectral resolution requirements for photointerpretations and/or multispectral pattern recognition of geomorphic elements and of cultural surface cover are listed. Requirements for photographic/analog or digital photogrammetry from spaceborne multispectral linear array sensors are included. A prioritized summary of data gaps in the geographic sciences is included. A.R.H.

N83-28510*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
HYDROLOGY TEAM
Robert Ragan *In its* The Multispectral Imaging Science Working Group, Vol. 3 1 Sep. 1982 7 p ERTS (For primary document see N83-28506 17-43)
Avail: NTIS HC A13/MF A01 CSCL 08H

General problems faced by hydrologists when using historical records, real time data, statistical analysis, and system simulation in providing quantitative information on the temporal and spatial distribution of water are related to the limitations of these data. Major problem areas requiring multispectral imaging-based research to improve hydrology models involve: evapotranspiration rates and soil moisture dynamics for large areas; the three dimensional characteristics of bodies of water; flooding in wetlands; snow water equivalents; runoff and sediment yield from ungaged watersheds; storm rainfall; fluorescence and polarization of water and its contained substances; discriminating between sediment and chlorophyll in water; role of barrier island dynamics in coastal zone processes; the relationship between remotely measured surface roughness and hydraulic roughness of land surfaces and stream networks; and modeling the runoff process. A.R.H.

N83-28511*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
INFORMATION SCIENCE TEAM
Fred Billingsley *In its* The Multispectral Imaging Science Working Group, Vol. 3 1 Sep. 1982 20 p ERTS (For primary document see N83-28506 17-43)
Avail: NTIS HC A13/MF A01 CSCL 05B

Concerns are expressed about the data handling aspects of system design and about enabling technology for data handling and data analysis. The status, contributing factors, critical issues, and recommendations for investigations are listed for data handling, rectification and registration, and information extraction. Potential supports to individual P.I., research tasks, systematic data system design, and to system operation. The need for an airborne spectrometer class instrument for fundamental research in high spectral and spatial resolution is indicated. Geographic information system formatting and labelling techniques, very large scale integration, and methods for providing multitype data sets must also be developed. A.R.H.

N83-28512*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
IMAGE SCIENCE TEAM
Ken Ando *In its* The Multispectral Imaging Science Working Group, Vol. 3 1 Sep. 1982 24 p ERTS (For primary document see N83-28506 17-43)
Avail: NTIS HC A13/MF A01 CSCL 05B

A substantial technology base of solid state pushbroom sensors exists and is in the process of further evolution at both GSFC and JPL. Technologies being developed relate to short wave infrared (SWIR) detector arrays; HgCdTe hybrid detector arrays; InSb linear and area arrays; passive coolers; spectral beam splitters; the deposition of spectral filters on detector arrays; and the functional design of the shuttle/space platform imaging spectrometer (SIS) system. Spatial and spectral characteristics of field, aircraft and space multispectral sensors are summaried. The status, field of view, and resolution of foreign land observing systems are included. A.R.H.

N83-28513*# Geological Survey, Moffett Field, Calif.
MAPPING URBAN LAND COVER FROM SPACE: SOME OBSERVATIONS FOR FUTURE PROGRESS
Leonard Gaydos *In* NASA. Goddard Space Flight Center The Multispectral Imaging Science Working Group, Vol. 3 1 Sep. 1982 8 p refs ERTS (For primary document see N83-28506 17-43)
Avail: NTIS HC A13/MF A01 CSCL 08B

The multilevel classification system adopted by the USGS for operational mapping of land use and land cover at levels 1 and 2 is discussed and the successes and failures of mapping land cover from LANDSAT digital data are reviewed. Techniques used for image interpretation and their relationships to sensor parameters are examined. The requirements for mapping levels 2 and 3 classes are considered. A.R.H.

N83-28514*# Arizona Univ., Tucson. Applied Remote Sensing Program.
PROJECTED TECHNOLOGICAL REQUIREMENTS FOR REMOTE SENSING OF TERRAIN VARIABLES
Charles F. Hutchinson *In* NASA. Goddard Space Flight Center The Multispectral Imaging Science Working Group, Vol. 3 1 Sep. 1982 14 p refs ERTS (For primary document see N83-28506 17-43)
Avail: NTIS HC A13/MF A01 CSCL 08B

Contributions of remote sensing to hydrogeomorphology and terrain analysis are reviewed in order to identify characteristics that should receive support in system and sensor configuration planning. Fluvial morphological studies, peak discharge modeling, and hydrogeomorphic floodplain mapping using large scale (1:12,000) to small scale (1:750,000) orbital photography are discussed as well as quantitative assessment of terrain variables for specific applications. A.R.H.

N83-28515*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
APPLICATION OF FUTURE REMOTE SENSING SYSTEMS TO IRRIGATION
Lee D. Miller (Nebraska Remote Sensing Center) *In its* The Multispectral Imaging Science Working Group, Vol. 3 1 Sep. 1982 6 p ERTS (For primary document see N83-28506 17-43)
Avail: NTIS HC A13/MF A01 CSCL 08H

Area estimates of irrigated crops and knowledge of crop type are required for modeling water consumption to assist farmers, rangers, and agricultural consultants in scheduling irrigation for distributed management of crop yields. Information on canopy physiology and soil moisture status on a spatial basis is potentially available from remote sensors, so the questions to be addressed relate to: (1) timing (data frequency, instantaneous and integrated measurement); and scheduling (widely distributed spatial demands); (2) spatial resolution; (3) radiometric and geometric accuracy and geoencoding; and (4) information/data distribution. This latter should be overnight, with no central storage, onsite capture, and low cost. A.R.H.

N83-28516*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
EVAPOTRANSPIRATION AND REMOTE SENSING
T. Schmugge and R. Gurney *In its* The Multispectral Imaging Science Working Group, Vol. 3 1 Sep. 1982 15 p refs ERTS (For primary document see N83-28506 17-43)
Avail: NTIS HC A13/MF A01 CSCL 06C

There are three things required for evapotranspiration to occur: (1) energy (580 cal/gm) for the change of phase of the water;

(2) a source of the water, i.e., adequate soil moisture in the surface layer or in the root zone of the plant; and (3) a sink for the water, i.e., a moisture deficit in the air above the ground. Remote sensing can contribute information to the first two of these conditions by providing estimates of solar insolation, surface albedo, surface temperature, vegetation cover, and soil moisture content. In addition there have been attempts to estimate precipitation and shelter air temperature from remotely sensed data. The problem remains to develop methods for effectively using these sources of information to make large area estimates of evapotranspiration. A.R.H.

N83-28517*# Water Resources Engineers, Inc., Springfield, Va.
COST EFFECTIVENESS OF CONVENTIONAL VERSUS LANDSAT USE DATA FOR HYDROLOGIC MODELING Final Report
Thomas S. George and Robert S. Taylor *In* NASA. Goddard Space Flight Center The Multispectral Imaging Science Working Group, Vol. 3 1 Sep. 1982 5 p ERTS (For primary document see N83-28506 17-43)
Avail: NTIS HC A13/MF A01 CSCL 08H

Six case studies were analyzed to investigate the cost effectiveness of using land use data obtained from LANDSAT as opposed to conventionally obtained data. A procedure was developed to determine the relative effectiveness of the two alternative means of acquiring data for hydrological modelling. The cost of conventionally acquired data ranged between $3,000 and $16,000 for the six test basins. Information based on LANDSAT imagery cost between $2,000 and $5,000. Results of the effectiveness analysis shows the differences between the two methods are insignificant. From the cost comparison and the act that each method, conventional and LANDSAT, is shown to be equally effective in developing land use data for hydrologic studies, the cost effectiveness of the conventional or LANDSAT method is found to be a function of basin size for the six test watersheds analyzed. The LANDSAT approach is cost effective for areas containing more than 10 square miles. A.R.H.

N83-28518*# Agricultural Research Services, Beltsville, Md.
USDA-ARS HYDROLOGY LABORATORY MISWG HYDROLOGY WORKSHOP
T. J. Jackson *In* NASA. Goddard Space Flight Center The Multispectral Imaging Science Working Group, Vol. 3 1 Sep. 1982 5 p refs ERTS (For primary document see N83-28506 17-43)
Avail: NTIS HC A13/MF A01 CSCL 08H

Current research being conducted in remote sensing techniques for measuring hydrologic parameters and variables deals with runoff curve numbers (CN), evapotranspiration (ET), and soil moisture. The CN and ET research utilizes visible and infrared measurements. Soil moisture investigations focus on the microwave region of the electromagnetic spectrum. A.R.H.

N83-28519*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE ROLE OF MULTISPECTRAL SCANNERS AS DATA SOURCES FOR EPA HYDROLOGIC MODELS
Rebecca Slack and David Hill *In its* The Multispectral Imaging Science Working Group, Vol. 3 1 Sep. 1982 4 p ERTS (For primary document see N83-28506 17-43)
Avail: NTIS HC A13/MF A01 CSCL 08H

An estimated cost savings of 30% to 50% was realized from using LANDSAT-derived data as input into a program which simulates hydrologic and water quality processes in natural and man-made water systems. Data from the satellite were used in conjunction with EPA's 11-channel multispectral scanner to obtain maps for characterizing the distribution of turbidity plumes in Flathead Lake and to predict the effect of increasing urbanization in Montana's Flathead River Basin on the lake's trophic state. Multispectral data are also being studied as a possible source of the parameters needed to model the buffering capability of lakes in an effort to evaluate the effect of acid rain in the Adirondacks. Water quality in Lake Champlain, Vermont is being classified using data from the LANDSAT and the EPA MSS. Both contact-sensed and MSS data are being used with multivariate statistical analysis to classify the trophic status of 145 lakes in Illinois and to identify water sampling sites in Appalachicola Bay where contaminants threaten Florida's shellfish. A.R.H.

N83-28520*# Geological Survey, Reston, Va.
HIGH RESOLUTION ANALYSIS
C. J. Robinove *In* NASA. Goddard Space Flight Center The Multispectral Imaging Science Working Group, Vol. 3 1 Sep. 1982 10 p ERTS (For primary document see N83-28506 17-43)
Avail: NTIS HC A13/MF A01 CSCL 08H

The possibilities for the use of high spectral resolution analysis in the field of hydrology and water resources are examined. Critical gaps in scientific knowledge that must be filled before technology can be evaluated involve the spectral response of water, substances dissolved and suspended in water, and substances floating on water. The most complete mapping of oil slicks can be done in the ultraviolet region. A mean of measuring the ultraviolet reflection at the surface from satellite altitudes needs to be determined. The use of high spectral resolution sensors in a reasonable number of narrow bands may be able to sense the reflectance or emission characteristics of water and its contained materials that can be correlated with commonly used water quality variables. Technological alternative available to experiment with problems of sensing water quality are to use existing remote sensing instrumentation in an empirical mode and to develop instruments for either testing hypoteses or conducting empirical experiments. A.R.H.

N83-28521*# California Univ., Davis.
THERMAL INFRARED RESEARCH: WHERE ARE WE NOW?
J. L. Hatfield and R. D. Jackson (Agricultural Research Service, Beltsville, Md.) *In* NASA. Goddard Space Flight Center The Multispectral Imaging Science Working Group, Vol. 3 1 Sep. 1982 17 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198 ERTS (For primary document see N83-28506 17-43)
Avail: NTIS HC A13/MF A01 CSCL 08H

The use of infrared temperatures in agriculture and hydrology is based on the energy balance equation which is used to estimate evapotranspiration and crop stress over small areas within a field as well as large areas. For its full utilization, this measurement must be combined with other spectral data collected at a time resolution sufficient to detect changes in the agricultural or hydrological systems and at a spatial resolution with enough detail to sample within individual fields. The most stringent requirement is that the data be readily available to the user. The spatial resolution necessary for IR measurements to be incorporated into evapotranspiration models to accurately estimate field and regional transpiration or measure crop stress; methods to estimate crop stress and yield over large areas and different cultivars within a species; the temporal resolution adequate for detecting crop stress or inclusion in evapotranspiration models; and ancillary parameters for estimating thermal IR measurements must be investigated. A.R.H.

N83-28522*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
RADIOMETRIC CONSIDERATIONS IN REMOTE SENSING SYSTEMS
Alexander F. H. Goetz *In* NASA. Goddard Space Flight Center The Multispectral Imaging Science Working Group, Vol. 3 1 Sep. 1982 4 p refs ERTS (For primary document see N83-28506 17-43)
Avail: NTIS HC A13/MF A01 CSCL 14B

All sensors systems designed to acquire quantitative data undergo radiometric calibration. The types and potential accuracies of calibration are discussed as well as the needs for calibration in the practical application of sensors. The recent and ongoing experience with the shuttle multispectral infrared radiometer is used as a reference. Author

N83-28523*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
POTENTIAL OF MULTISENSOR DATA AND STRATEGIES FOR

DATA ACQUISITION AND ANALYSIS
Diane Evans and Ron Blom *In* NASA. Goddard Space Flight Center The Multispectral Imaging Science Working Group, Vol. 3 1 Sep. 1982 6 p refs ERTS (For primary document see N83-28506 17-43)
Avail: NTIS HC A13/MF A01 CSCL 05B

Registration and simultaneous analysis of multisensor images is useful because the multiple data sets can be compressed through image processing techniques to facilitate interpretation. This also allows integration of other spatial data sets. Techniques being developed to analyze multisensor images involve comparison of image data with a library of attributes based on physical properties measured by each sensor. This results in the ability to characterize geologic units based on their similarity to the library attributes, as well as discriminate among them. Several studies can provide information on ways to optimize multisensor remote sensing. Continued analyses of the Death Valley and San Rafael Swell data sets can provide insight into tradeoffs in spectral and spatial resolutions of the various sensors used to obtain the coregistered data sets. These include imagery from LANDSAT, SEASAT, HCMM, SIR-A, 11-channel VIS-NIR, thermal inertia images, and aircraft L- and X-band radar. A.R.H.

N83-28524*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
GEOLOGIC UTILITY OF IMPROVED ORBITAL MEASUREMENTS
A. R. Gillespie *In* NASA. Goddard Space Flight Center The Multispectral Imaging Science Working Group, Vol. 3 1 Sep. 1982 2 p ERTS (For primary document see N83-28506 17-43)
Avail: NTIS HC A13/MF A01 CSCL 08B

From a geologists point of view, the most important use of orbital cameras is probably to provide spatial or context information in remote areas. This information can be extracted even from broad-band, single channel images provided that the spatial resolution is adequate for the problem at hand. Topographic information, usually provided by stereoscopic images, is next in importance. Any satellite system designed to satisfy general geologic requirements must produce stereo images, preferably with large base/height ratios of 0.5 or more. Satellite coverage at different illumination geometries could provide low Sun angles for regions of low relief where topography must be accentuated, and high Sun angles for areas of high relief or when multispectral data are being collected. Thus a different polar orbit than that of LANDSAT would be advantageous. The extended spectral sensitivity of scanner permits interferences of the composition of rocks in the scene to be drawn directly, rather than from contextual clues. A.R.H.

N83-28525*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
MIDDLE INFRARED REMOTE SENSING FOR GEOLOGY
Anne B. Kahle *In* NASA. Goddard Space Flight Center The Multispectral Imaging Science Working Group, Vol. 3 1 Sep. 1982 10 p ERTS (For primary document see N83-28506 17-43)
Avail: NTIS HC A13/MF A01 CSCL 08G

The middle infrared portion of the spectrum available for geologic remote sensing extends from approximately 3 to 25 micrometers. The source of energy is thermal radiation from surface materials and ambient terrestrial temperatures. The spectral range of usefulness is limited by both the amount of energy available and by transmission of energy through the atmosphere. The best atmospheric window lies between about 8 and 14 micrometers. Remote sensing of the Earth in the infrared is just on the threshold of becoming a valuable geologic tool. Topics which need study include: (1) the used and limitations of the 8 to 14 micrometer region for distinguishing between silicates and nonsilicates; (2) theoretical and experimental understanding of laboratory spectra of rocks and minerals and their relationship to remotely sensed emission spectra; and (3) the possible use of the 3 to 5 and 17 to 25 micrometer portions of the spectrum for remote sensing. A.R.H.

N83-28526*# Columbia Univ., New York. Lab. of Applied Geophysics.
AIRBORNE INFRARED MINERAL MAPPING SURVEY OF MARYSVALE, UTAH
William Collins and Sheng-Husi Chang *In* NASA. Goddard Space Flight Center The Multispectral Imaging Science Working Group, Vol. 3 1 Sep. 1982 35 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198 ERTS (For primary document see N83-28506 17-43)
Avail: NTIS HC A13/MF A01 CSCL 08B

Infrared spectroradiometer survey results from flights over the Marysvale, Utah district show that hydrothermal alteration mineralogy can be mapped using very rapid and effective airborne techniques. The system detects alteration mineral absorption band intensities in the infrared spectral region with high sensitivity. The higher resolution spectral features and high spectral differences characteristic of the various clay and carbonate minerals are also readily identified by the instrument allowing the mineralogy to be mapped as well as the mineralization intensity. A.R.H.

N83-28527*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
EFFECTS OF SPATIAL RESOLUTION
Michael Abrams *In* NASA. Goddard Space Flight Center The Multispectral Imaging Science Working Group, Vol. 3 1 Sep. 1982 4 p refs ERTS (For primary document see N83-28506 17-43)
Avail: NTIS HC A13/MF A01 CSCL 08G

Studies of the effects of spatial resolution on extraction of geologic information are woefully lacking but spatial resolution effects can be examined as they influence two general categories: detection of spatial features per se; and the effects of IFOV on the definition of spectral signatures and on general mapping abilities. A.R.H.

N83-28528*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
EFFECT OF ALUMINUM SUBSTITUTION ON THE REFLECTANCE SPECTRA OF HEMATITE
Richard V. Morris, Howard V. Lauer, Jr. (Lockheed Engineering and Management Services Co., Houston, Tex.), and Wendell W. Mendell *In* NASA. Goddard Space Flight Center The Multispectral Imaging Science Working Group, Vol. 3 1 Sep. 1982 4 p ERTS (For primary document see N83-28506 17-43)
Avail: NTIS HC A13/MF A01 CSCL 08G

Hematite and aluminous hematite were synthesized and the diffuse reflectance spectra were recorded for the region between 0.35 and 1.20 microns. Results show that the near-IR based minimum for the aluminous hematite is shifted longward by about 0.02 microns and is much more shallow. Also, the aluminous specimen is considerably more reflective shortward of approximately 0.55 microns where the ferritic specimen is strongly absorbing. This is noteworthy since the visible slope and the red shoulder are often used in the construction of false color and band ratio images. M.G.

N83-28529*# Hawaii Inst. of Geophysics, Honolulu. Planetary Geosciences.
VISIBLE AND NEAR-IR SPECTRAL REFLECTANCE OF GEOLOGICALLY IMPORTANT MATERIALS: A SHORT REVIEW
Robert B. Singer *In* NASA. Goddard Space Flight Center The Multispectral Imaging Science Working Group, Vol. 3 1 Sep. 1982 9 p refs ERTS (For primary document see N83-28506 17-43)
Avail: NTIS HC A13/MF A01 CSCL 08G

Examples of reflectance spectra are presented and discussed for various mineral groups including pyroxenes, olivene, phylosilicates, amphiboles, feldspars, oxides and hydroxides, carbonates, and mixtures of minerals. The physical sources of some spectral features are also reviewed such as charge transfer and conduction bands, crystal field absorptions, and vibrational absorptions. M.G.

N83-28530*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

SPATIAL AND SPECTRAL RESOLUTION NECESSARY FOR REMOTELY SENSED VEGETATION STUDIES
Barrett N. Rock *In* NASA. Goddard Space Flight Center The Multispectral Imaging Science Working Group, Vol. 3 1 Sep. 1982 5 p refs ERTS (For primary document see N83-28506 17-43)
Avail: NTIS HC A13/MF A01 CSCL 02C

An outline is presented of the required spatial and spectral resolution needed for accurate vegetation discrimination and mapping studies as well as for determination of state of health (i.e., detection of stress symptoms) of actively growing vegetation. Good success was achieved in vegetation discrimination and mapping of a heterogeneous forest cover in the ridge and valley portion of the Appalachians using multispectral data acquired with a spatial resolution of 15 m (IFOV). A sensor system delivering 10 to 15 m spatial resolution is needed for both vegetation mapping and detection of stress symptoms. Based on the vegetation discrimination and mapping exercises conducted at the Lost River site, accurate products (vegetation maps) are produced using broad-band spectral data ranging from the .500 to 2.500 micron portion of the spectrum. In order of decreasing utility for vegetation discrimination, the four most valuable TM simulator VNIR bands are: 6 (1.55 to 1.75 microns), 3 (0.63 to 0.69 microns), 5 (1.00 to 1.30 microns) and 4 (0.76 to 0.90 microns). M.G.

N83-28531*# Washington Univ., Seattle. Dept. of Geological Sciences.
ANALYSIS OF LITHOLOGY: VEGETATION MIXES IN MULTISPECTRAL IMAGES
John B. Adams, Milton Smith, and Jill D. Adams *In* NASA. Goddard Space Flight Center The Multispectral Imaging Science Working Group, Vol. 3 1 Sep. 1982 4 p ERTS (For primary document see N83-28506 17-43)
Avail: NTIS HC A13/MF A01 CSCL 02C

Discrimination and identification of lithologies from multispectral images is discussed. Rock/soil identification can be facilitated by removing the component of the signal in the images that is contributed by the vegetation. Mixing models were developed to predict the spectra of combinations of pure end members, and those models were refined using laboratory measurements of real mixtures. Models in use include a simple linear (checkerboard) mix, granular mixing, semi-transparent coatings, and combinations of the above. The use of interactive computer techniques that allow quick comparison of the spectrum of a pixel stack (in a multiband set) with laboratory spectra is discussed. M.G.

N83-28532*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
GEOLOGIC UTILITY OF IMPROVED ORBITAL MEASUREMENT CAPABILITIES IN REFERENCE TO NON-RENEWABLE RESOURCES
H. Stewart and S. Marsh *In its* The Multispectral Imaging Science Working Group, Vol. 3 1 Sep. 1982 5 p ERTS (For primary document see N83-28506 17-43)
Avail: NTIS HC A13/MF A01 CSCL 08G

Spectral and spatial characteristics necessary for future orbital remote sensing systems are defined. The conclusions are based on the past decade of experience in exploring for non-renewable resources with reference to data from ground, aircraft, and orbital systems. Two principle areas of investigation are used in the discussion: a structural interpretation in a basin area for hydrocarbon exploration, and a discrimination of altered areas in the Cuprite district in Nevada. M.G.

N83-28533*# Geological Survey, Denver, Colo.
CONSIDERATIONS CONCERNING FUTURE SATELLITE EXPERIMENTS
Gary L. Raines *In* NASA. Goddard Space Flight Center The Multispectral Imaging Science Working Group, Vol. 3 1 Sep. 1982 4 p ERTS (For primary document see N83-28506 17-43)
Avail: NTIS HC A13/MF A01 CSCL 05B

Areas of research which would be particularly beneficial to the application of remote sensing to mineral exploration are suggested and discussed. These areas are (1) refinement of spectral data in the .4 to 2.5 micron region, (2) systematic research in spatial resolution, and (3) better data for geological structural studies. M.G.

N83-28534*# Hawaii Univ., Honolulu. Planetary Geosciences.
A NEXT-GENERATION MAPPING SPECTROMETER
R. B. Singer *In* NASA. Goddard Space Flight Center The Multispectral Imaging Science Working Group, Vol. 3 1 Sep. 1982 5 p ERTS (For primary document see N83-28506 17-43)
Avail: NTIS HC A13/MF A01 CSCL 08B

Operational and design characteristics for a remote sensing instrument for aircraft and orbital use are defined. The ideal instrument would be based around two-dimensional detector arrays, silicon for the visible and very-near infrared (0.4 to 1.0 microns) and InSb or PbS for the rest of the near-infrared (out to about 2.6 microns). Spectral information would be dispersed along one axis. Thus one exposure or frame would simultaneously record a full spectrum for each pixel in a row perpendicular to the ground track. The instrument should be smart and versatile, with extensive pre-processing capability programmable from the ground. Spatial and spectral resolution, signal to noise radio, data precision, and calibration and atmospheric corrections are also discussed. M.G.

N83-28535*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
REGISTRATION WORKSHOP REPORT
H. K. Ramapriyan *In its* The Multispectral Imaging Science Working Group, Vol. 3 1 Sep. 1982 38 p refs ERTS (For primary document see N83-28506 17-43)
Avail: NTIS HC A13/MF A01 CSCL 05B

The state-of-the-art in registration and rectifiction of image data for terrestrial applications is examined and recommendations for further research in these areas are made. M.G.

N83-28536*# Geological Survey, Reston, Va.
MAPSAT COMPARED TO OTHER EARTH-SENSING CONCEPTS
Alden P. Colvocoresses *In* NASA. Goddard Space Flight Center The Multispectral Imaging Science Working Group, Vol. 3 1 Sep. 1982 8 p refs Presented at the 15th Intern. Symp. on Remote Sensing of Environ., Ann Arbor, Mich., May 1981 ERTS (For primary document see N83-28506 17-43)
Avail: NTIS HC A13/MF A01 CSCL 22B

The instrument systems and operational capabilities of MAPSAT are discussed. The satellite is based on LANDSAT technology and includes the following concepts: global coverage on a continuous basis; open data dissemination in reasonable time and cost; variable resolution, swath-width, stereoscopic and multispectral capabilities; 1:50,000-scale image mapping with a 20-m contour interval; continuity with LANDSAT-1,-2, and -3 including the same basic data transmission and reception system; and one-dimensional data processing. M.G.

N83-28537*# Geological Survey, Reston, Va.
AN AUTOMATED MAPPING SATELLITE SYSTEM (MAPSAT)
Alden P. Colvocoresses *In* NASA. Goddard Space Flight Center The Multispectral Imaging Science Working Group, Vol. 3 1 Sep. 1982 18 p refs ERTS (For primary document see N83-28506 17-43)
Avail: NTIS HC A13/MF A01 CSCL 22B

Digital data from highly stabilized stereo linear arrays are amenable to simplified processing to produce both planimetric imatery and elevation data. A satellite, called MAPSAT, including this concept was proposed to accomplish automated mapping in near real time. Image maps as large as 1:50,000 scale with contours as close as 20-m interval may be produced from MAPSAT data. Author

N83-28538*# Santa Barbara Research Center, Goleta, Calif.
DESIGN TRADEOFFS FOR A MULTISPECTRAL LINEAR ARRAY (MLA) INSTRUMENT
Aram M. Mika *In* NASA. Goddard Space Flight Center The Multispectral Imaging Science Working Group, Vol. 3 1 Sep. 1982

9 p refs ERTS (For primary document see N83-28506 17-43) (Contract NAS5-26591)
Avail: NTIS HC A13/MF A01 CSCL 14B

The heart of the multispectral linear array (MLA) design problem is to develop an instrument concept which concurrently provides a wide field-of-view with high resolution, spectral separation with precise band-to band registration, and excellent radiometric accuracy. Often, these requirements have conflicting design implications which can only be resolved by careful tradeoffs that consider performance, cost, fabrication feasibility and development risk. The key design tradeoffs for an MLA instrument are addressed, and elements of a baseline instrument concept are presented.
Author

N83-28539*# RCA Labs., Princeton, N. J.
HIGH DENSITY SCHOTTKY BARRIER IRCCD SENSORS FOR SWIR APPLICATIONS AT INTERMEDIATE TEMPERATURE
H. Elabd, T. S. Villani, and J. R. Tower (RCA Advanced Technology Labs.) *In* NASA. Goddard Space Flight Center The Multispectral Imaging Science Working Group, Vol. 3 1 Sep. 1982 11 p Sponsored by RADC ERTS (For primary document see N83-28506 17-43)
Avail: NTIS HC A13/MF A01 CSCL 14B

Monolithic 32 x 64 and 64 x 1:128 palladium silicide (Pd2Si) interline transfer infrared charge coupled devices (IRCCDs) sensitive in the 1 to 3.5 micron spectral band were developed. This silicon imager exhibits a low response nonuniformity of typically 0.2 to 1.6% rms, and was operated in the temperature range between 40 to 140 K. Spectral response measurements of test Pd2Si p-type Si devices yield quantum efficiencies of 7.9% at 1.25 microns, 5.6% at 1.65 microns 2.2% at 2.22 microns. Improvement in quantum efficiency is expected by optimizing the different structural parameters of the Pd2Si detectors. The spectral response of the Pd2Si detectors fit a modified Fowler emission model. The measured photo-electric barrier height for the Pd2Si detectors is 0.34 eV and the measured quantum efficiency coefficient, C1, is 19%/eV. The dark current level of Pd2Si Schottky barrier focal plane arrays (FPAs) is sufficiently low to enable operation at intermediate temperatures at TV frame rates. Typical dark current level measured at 120 K on the FPA is 2 nA/sq cm. The operating temperature of the Pd2Si FPA is compatible with passive cooler performance. In addition, high density Pd2Si Schottky barrier FPAs are manufactured with high yield and therefore represent an economical approach to short wavelength IR imaging. A Pd2Si Schottky barrier image sensor for push-broom multispectral imaging in the 1.25, 1.65, and 2.22 micron bands is being studied. The sensor will have two line arrays (dual band capability) of 512 detectors each, with 30 micron center-to-center detector spacing. The device will be suitable for chip-to-chip abutment, thus providing the capability to produce large, multiple chip focal planes with contiguous, in-line sensors. M.G.

N83-28540*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
MULTISPECTRAL LINEAR ARRAY (MLA) SCIENCE AND TECHNOLOGY PROGRAM
W. L. Barnes *In its* The Multispectral Imaging Science Working Group, Vol. 3 1 Sep. 1982 29 p ERTS (For primary document see N83-28506 17-43)
Avail: NTIS HC A13/MF A01 CSCL 14B

A Goddard Space Flight Center program of science studies and technology development to provide the basis for future earth observation sensors employing multispectral linear array (MLA) technology is described. Establishment of MLA performance parameters and performance modeling make up the primary science activities. Critical technologies being developed include: short-wave infrared (SWIR) detector arrays, visible/and near infrared detector arrays, and passive cryogenic coolers. Supporting activities include: test and field instrument development, focal plane research and assessment laboratory, system simulation laboratory, calibration sources and techniques, optics, and thermal infrared arrays. M.G.

N83-28541*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
THE IMAGING SPECTROMETER APPROACH
John B. Wellman *In* NASA. Goddard Space Flight Center The Multispectral Imaging Science Working Group, Vol. 3 1 Sep. 1982 22 p ERTS (For primary document see N83-28506 17-43)
Avail: NTIS HC A13/MF A01 CSCL 14B

Two important sensor design drivers are the requirement for spatial registration of the spectral components and the implementation of the advanced multispectral capability, including spectral band width, number of bands and programmability. The dispersive approach, fundamental to the imaging spectrometer concept, achieves these capabilities by utilizing a spectrometer to disperse the spectral content while preserving the spatial identity of the information in the cross-track direction. Area array detectors in the spectrometer focal plane detect and store the spatial and multispectral content for each line of the image. The choice of spectral bands, image IFOV and swath width is implemented by programmed readout of the focal plane. These choices in conjunction with data compression are used to match the output data rate with the telemetry link capability. Progress in the key technologies of optics, focal plane detector arrays, onboard processing, and focal plane cooling supports the viability of the imaging spectrometer approach. M.G.

N83-28542*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
IMAGING SPECTROMETER TECHNOLOGIES FOR ADVANCED EARTH REMOTE SENSING
J. B. Wellman, J. B. Breckinridge, P. Kuperfman, R. P. Salazar, and K. B. Sigurdson *In* NASA. Goddard Space Flight Center The Multispectral Imaging Science Working Group, Vol. 3 1 Sep. 1982 8 p refs ERTS (For primary document see N83-28506 17-43)
Avail: NTIS HC A13/MF A01 CSCL 14B

A major requirement of multispectral imaging systems for advanced Earth remote sensing is the provision for greater spectral resolution and more versatile spectral band selection. The imaging spectrometer instrument concept provides this versatility by the combination of pushbroom imaging and spectrally dispersing optics using area array detectors in the focal plane. The shuttle imaging spectrometer concept achieves 10- and 20-meter ground instantaneous fields of view with 20-nanometer spectral resolution from Earth Orbit. Onboard processing allows the selection of spectral bands during flight; this, in turn, permits the sensor parameters to be tailored to the experiment objectives. Advances in optical design, infrared detector arrays, and focal plane cooling indicate the feasibility of the instrument concept and support the practicability of a validation flight experiment for the shuttle in the late 1980s. M.G.

N83-28543*# Rockwell International Science Center, Thousand Oaks, Calif.
IR AREA ARRAY STATUS
Jon Rode *In* NASA. Goddard Space Flight Center The Multispectral Imaging Science Working Group, Vol. 3 1 Sep. 1982 26 p ERTS (For primary document see N83-28506 17-43)
Avail: NTIS HC A13/MF A01 CSCL 14B

Leading array technologies are defined and the status of HgCdTe hybrid focal plane development is reported. The liquid phase epitaxy system for HgCdTe production is also discussed.
M.G.

N83-28544*# Arizona Univ., Tucson. Optical Sciences Center.
ABSOLUTE RADIOMETRIC CALIBRATION OF ADVANCED REMOTE SENSING SYSTEMS
P. N. Slater *In* NASA. Goddard Space Flight Center The Multispectral Imaging Science Working Group, Vol. 3 1 Sep. 1982 6 p refs ERTS (For primary document see N83-28506 17-43) (Grant NAG5-196)
Avail: NTIS HC A13/MF A01 CSCL 20F

The distinction between the uses of relative and absolute spectroradiometric calibration of remote sensing systems is

discussed. The advantages of detector-based absolute calibration are described, and the categories of relative and absolute system calibrations are listed. The limitations and problems associated with three common methods used for the absolute calibration of remote sensing systems are addressed. Two methods are proposed for the in-flight absolute calibration of advanced multispectral linear array systems. One makes use of a sun-illuminated panel in front of the sensor, the radiance of which is monitored by a spectrally flat pyroelectric radiometer. The other uses a large, uniform, high-radiance reference ground surface. The ground and atmospheric measurements required as input to a radiative transfer program to predict the radiance level at the entrance pupil of the orbital sensor are discussed, and the ground instrumentation is described. M.G.

N83-28545*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
JPL AIRBORNE INSTRUMENTS ACTIVITIES
Gregg Vane *In* NASA. Goddard Space Flight Center The Multispectral Imaging Science Working Group, Vol. 3 1 Sep. 1982 10 p ERTS (For primary document see N83-28506 17-43)
Avail: NTIS HC A13/MF A01 CSCL 14B

Two instruments intended for flight aboard aircraft for research in advanced remote sensing of the earth are under development: the airborne imaging spectrometer (AIS) and the airborne visible-infrared imaging spectrometer (AVIRIS). The AIS utilizes a 32 x 32 element HgCdTe CCD array to gather 10nm spectral data, initially in the 1.2 to 2.4 micron range, with 32 pixels of cross-track spatial data. The instrument acquires 128 channels of spectral data by using a grating spectrometer whose grating is stepped through four positions during a fraction of an IFOV time on the ground. With an IFOV of 2 mrad, the GIFOV at the design altitude of 3 km is 6m. The instrument has several on-board processing capabilities including ax+b corrections for detector calibration, cross-track and down-track pixel summing, spectral band summing, and variable integration time to allow flight at various altitudes and velocities. The AVIRIS uses a proven scanning mechanism to acquire the spatial data in a whisk broom mode. The spectral coverage is from 0.35 to 2.5 microns at bandwidths ranging from 10 to 20 nm. M.G.

N83-28546*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
AIRBORNE MULTISPECTRAL LINEAR ARRAY INSTRUMENTS AT GODDARD SPACE FLIGHT CENTER
James R. Irons, James C. Smith, and William L. Barnes *In its* The Multispectral Imaging Science Working Group, Vol. 3 1 Sep. 1982 17 p refs ERTS (For primary document see N83-28506 17-43)
Avail: NTIS HC A13/MF A01 CSCL 14B

The fabrication of airborne instruments is contributing to the development of multispectral linear array technology at NASA's Goddard Space Flight Center. The linear array pushbroom radiometer (LAPR-I), was built to demonstrate capabilities for acquiring digital image data using linear arrays. The LAPR-I employed three arrays of 512 silicon photodiodes each to simultaneously acquire three channels of data for spectral bands within the visible and near-infrared portions of the spectrum. A second instrument, LAPR-II, uses four arrays each consisting of 512 silicon detectors. A filter wheel containing six spectral filters is used in conjunction with each array to allow filter changes in flight. This capability will facilitate studies into the utility of various bands within the visible and near infrared portions of the spectrum. The LAPR-II's aircraft mounting will allow off-nadir pointing (plus-or-minus 50 deg fore-and-aft and side-to-side) which will enable investigations of the radiometric and geometric effects of off-nadir viewing. A short wave infrared radiometer is also described. M.G.

N83-28547*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
IMAGE DATA COMPRESSION APPLICATION TO IMAGING SPECTROMETERS Progress Report
Robert F. Rice and Jun-Ji Lee *In* NASA. Goddard Space Flight Center The Multispectral Imaging Science Working Group, Vol. 3 1 Sep. 1982 24 p refs ERTS (For primary document see N83-28506 17-43)
Avail: NTIS HC A13/MF A01 CSCL 14B

The potential of image data compression techniques to satisfy the anticipated requirements of imaging spectrometer missions is discussed. Noiseless coding, rate controlled compression, cluster compression, and error protection are addressed. M.G.

N83-28548*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ON-BOARD IMAGE COMPRESSION
Thomas J. Lynch *In its* The Multispectral Imaging Science Working Group, Vol. 3 1 Sep. 1982 25 p ERTS (For primary document see N83-28506 17-43)
Avail: NTIS HC A13/MF A01 CSCL 05B

Image data compression schemes are discussed with regard to achieving maximum compression ratio. It is demonstrated that the compression ratio must be traded-off against the allowable residual distortion in the reconstructed image. M.G.

N83-28549*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
IMAGE PROCESSING VIA VLSI: A CONCEPT PAPER
Robert Nathan *In its* The Multispectral Imaging Science Working Group, Vol. 3 1 Sep. 1982 refs ERTS (For primary document see N83-28506 17-43)
Avail: NTIS HC A13/MF A01 CSCL 05B

Implementing specific image processing algorithms via very large scale integrated systems offers a potent solution to the problem of handling high data rates. Two algorithms stand out as being particularly critical -- geometric map transformation and filtering or correlation. These two functions form the basis for data calibration, registration and mosaicking. VLSI presents itself as an inexpensive ancillary function to be added to almost any general purpose computer and if the geometry and filter algorithms are implemented in VLSI, the processing rate bottleneck would be significantly relieved. A set of image processing functions that limit present systems to deal with future throughput needs, translates these functions to algorithms, implements via VLSI technology and interfaces the hardware to a general purpose digital computer is developed. M.G.

N83-28550*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ATMOSPHERIC EFFECTS ON RADIOMETRY FROM ZENITH OF A PLANE WITH DARK VERTICAL PROTRUSIONS
Joseph Otterman Mar. 1983 29 p refs Prepared in cooperation with Tel Aviv Univ., Ramat Aviv, Israel
(NASA-TM-84999; NAS 1.15:84999) Avail: NTIS HC A03/MF A01 CSCL 20F

Effects of an optically thin plane-parallel scattering atmosphere on radiometric imaging from the zenith of a specific surface-type are analyzed. The surface model was previously developed to describe arid steppe, where the sparse vegetation forms dark vertical protrusions from the bright soil-plane. The analysis is in terms of the surface reflectivity to the zenith r sub p for the direct beam, which is formulated as r sub p = r sub i exp (-s tan theta sub 0), where v sub i is the Lambert law reflectivity of the soil, the protrusions parameters s is the projection on a vertical plane of protrusions per unit area and theta sub 0 is the zenith angle. The surface reflectivity r sub p is approximately equal to that for the global irradiance (which is directly measured in the field) only for a narrow range of the solar zenith angles. The effects of the atmosphere when imaging large uniform areas of this type are comparable to those in imaging a Lambert surface with a reflectivity r sub p. Thus, the effects can be approximated by those in the case of a dark Lambert surface (analyzed previously), inasmuch as r sub p is smaller than the soil reflectivity r sub i for any off-zenith illumination. The surface becomes effectively darker with increasing solar zenith angle. Adjacency effects of a reflection from one area and scattering in the instantenous field of view

(object pixel) are analyzed as cross radiance and cross irradiance. Author

N83-28551*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
REMOTE SENSING BY INFRARED HETERODYNE SPECTROSCOPY
Theodor Kostiuk and Michael J. Mumma Jun. 1983 45 p refs (NASA-TM-85047; NAS 1.15:85047) Avail: NTIS HC A03/MF A01 CSCL 14B

The use of infrared heterodyne spectrocopy for the study of planetary atmospheres is discussed. Infrared heterodyne spectroscopy provides a convenient and sensitive method for measuring the true intensity profiles of atmospheric spectral lines. Application of radiative transfer theory to measured lineshapes can then permit the study of molecular abundances, temperatures, total pressures, excitation conditions, and dynamics of the regions of line formation. The theory of formation of atmospheric spectral lines and the retrieval of the information contained in these molecular lines is illustrated. Notable successes of such retrievals from infrared heterodyne measurements on Venus, Mars, Jupiter and the Earth are given. A discussion of developments in infrared heterodyne technology is also presented. S.L.

N83-28552# Delaware Univ., Newark. Center for Remote Sensing.
TIDAL WETLANDS MAPS REVISION, 1979 Final Report
Michael A. Hardisky and Vytautas Klemas Aug. 1981 18 p refs (CRS-02-82) Avail: NTIS HC A02/MF A01

The process of the wetlands maps' revision is described, information on changes in Delaware's wetlands is provided. The objective of the revision effort was to detect and record any changes in the areal extent of wetlands and to classify these changes according to the supposed causal agent. Author

N83-28553# Delaware Univ., Newark. Center for Remote Sensing.
TECHNOLOGY TRANSFER TO DEVELOPING COUNTRIES: FUTURE USE OF REMOTE SENSING IN BIOLOGICAL MARINE RESOURCE DEVELOPMENT
V. Klemas 1981 24 p refs Presented at the Workshop on Future of Intern. Cooperation in Marine Technol., Sci. and Fisheries, La Jolla, Calif., 18-22 Jan. 1981
(CRS-1-81) Avail: NTIS HC A02/MF A01

Developing countries are showing an increasing interest in remote sensing technology for the development of their renewable and nonrenewable resources. Although most of the early applications of remote sensing were in the agricultural and geological areas, the synoptic and repetitive coverage of satellites seems particularly well suited for monitoring the properties and managing the resources of large coastal and marine regions. The transfer of remote sensing techniques to developing countries is aided considerably by regional and national centers that are staffed and equipped to handle LANDSAT technology. Developments in marine related remote sensing, such as synthetic aperture radar for wave studies, microwave radiometers for salinity measurements, and multispectral scanners and laser fluorosensors for chlorophyll mapping require a concerted effort by national and international agencies to set up regional centers, sponsor joint research programs, and conduct workshops for transferring this technology to interested developing countries. S.L.

N83-28554# Naval Ocean Research and Development Activity, Bay St. Louis, Miss. Ocean Science and Technology Lab.
INTERPRETATION OF HYDROGRAPHIC FEATURES USING LANDSAT IMAGES
Robert A. Arnone and B. Edward Arthur, Jr. Jun. 1981 237 p refs
(AD-A125760; NORDA-39) Avail: NTIS HC A11/MF A01 CSCL 08/10

LANDSAT imagery provides a means for updating hydrographic charts. This manual is designed to instruct analysts in interpreting hydrographic features and coastal processes using LANDSAT imagery. Explanations are given of both the physical processes and remote sensing technology as related to interpretation of hydrographic features. Through comparisons of hydrographic charts, aerial photography and the various spectral channels of LANDSAT imagery, the manual clearly illustrates examples of interpreting hydrographic features and processes. Various case histories illustrating different coastal regimes and hydrographic features are presented, with descriptions of the techniques used for interpretation. Methodologies for exploitation of LANDSAT imagery for updating nautical charts (inclusive of hazard detection, chart revision, zones of safe passages, and survey planning) are described. Author (GRA)

N83-28555# Pacific Northwest Lab., Richland, Wash.
ECOLOGICAL PERSPECTIVES FROM LAND-USE HISTORY: THE ARID LANDS ECOLOGY RESERVE (ALE)
N. R. Hinds Mar. 1982 15 p refs Presented at Northwest Sci. Assoc. Meeting, College Place, Wash., 17 Mar. 1982
(Contract DE-AC06-76RL-01830)
(DE82-019175; PNL-SA-10137; CONF-820384-1) Avail: NTIS HC A02/MF A01

The major land uses of the arid lands ecology reserve from the late 1800's through 1940 were winter sheep grazing, homesteading, gas drilling and production, and road building. Current land use practices are tabulated. DOE

N83-28556# California Univ., Livermore. Lawrence Livermore Lab.
GROUND-BASED OPTICAL-REMOTE-SENSING RESULTS FROM 1981 ASCOT FIELD EXPERIENCE
W. M. Porch May 1982 24 p refs
(DE82-014890; UCID-19377) Avail: NTIS HC A02/MF A01

Ground based optical remote sensing techniques provided the following major results from the 1981 ASCOT field experiment: spatial averaging cross-path optical anemometry provide down- and up-valley winds for two confluent valleys which merged near the tracer release site; comparison and analyses of these data show evidence for interaction of two valley systems during nighttime drainage wind conditions with each other as well as with meso-scale seabreeze influences; the timing of transition periods of drainage initiation and cessation gave important clues to the nature of the drainage process; spatially averaged lapse-rates were determined at selected times during two drainage wind experiment nights; these data compared well with tethersonde temperature profile data and will in the future provide data useful for Richardson Number estimation; and qualitative data of plume behavior was observed using searchlight aided nighttime photographic techniques. DOE

N83-28557# Geological Survey, Augusta, Maine.
MAINE PEAT-RESOURCE EVALUATION PROGRAM: 1980 FIELD SEASON
Cornelia C. Cameron, Carolyn A. Lepage, Walter A. Anderson, and Joel Davis 1982 177 p refs
(Contract DE-FG18-79FC-14960)
(DE82-017207; DOE/FC-14690/T3; Open-File-82-8) Avail: NTIS HC A09/MF A01

The second year of the Maine Peat Resource Evaluation Program, which is funded by the US Department of Energy to assess the fuel potential of Maine's peat deposits, was completed in 1980. During the 1980 field season, 56 peat deposits in Piscataquis, Somerset, Aroostook, Kennebec, and Waldo Counties were investigated. These deposits range in size from 44 to 1344 acres and contain from 50,000 to 3,200,000 short tons of air-dried peat. A total of 14,262 acres containing an estimated 23,908,000 short tons of air-dried peat were evaluated. To date, a total of 44,340 acres in 163 deposits containing 83,757,000 short tons of air-dried peat have been surveyed under the Maine Peat Resource Evaluation Program. DOE

N83-28558# Los Alamos Scientific Lab., N. Mex.
DEVELOPMENT OF A PROCEDURE TO ESTIMATE RUNOFF AND SEDIMENT TRANSPORT IN EPHEMERAL STREAMS

Leonard J. Lane 1982 14 p refs Presented at the 4th Symp. of the Intern. Assoc. of Hydrological Sci., Exeter, Engl., 19-30 Jul. 1982
(Contract W-7405-eng-36)
(DE82-002368; LA-UR-81-3017; CONF-820701-1) Avail: NTIS HC A02/MF A01

A distributed hydrologic model for application on small, semiarid watersheds is developed. The distributed model incorporates simplified routing schemes to include the influence of transmission losses on runoff. A sediment transport model, by sediment size fractions, is developed to compute transport capacity and sediment yield in noncohesive, alluvial channels. Based on available information published in soils and topographic maps and on channel and bed sediment characteristics, the procedure is used to estimate runoff rates and amounts together with sediment yields from semiarid watersheds. Example applications include flood frequency analysis and sediment yield. The procedure requires a minimum of observed data for calibration and is designed for practical applications. DOE

N83-28559# CLD Group, Inc., Ventura, Calif.
FIELD DEMONSTRATION OF THE CONVENTIONAL STEAM-DRIVE PROCESS WITH ANCILLARY MATERIALS Annual Report, 1 Oct. 1980 - 31 Oct. 1981
Ron Bowman and Harold Lechtenberg Jul. 1982 82 p
(Contract DE-FC03-79SF-10761)
(DE82-018240; DOE/SF-10761-2; AR-2) Avail: NTIS HC A05/MF A01

The efficiency of steam drive improvement by ancillary material, surfactant based foam was demonstrated. The initial laboratory work involved screening foam chemicals for thermal stability and testing methods of placing them deep into a porous media. The emplacement techniques and the capacity of the chemical system to control the mobility of injected steam was verified. Two major technical problems encountered in steam drive operations were addressed, namely, the excessive channeling of steam through thief zones, and the progressive increase in steam flow through oil depleted, already swept zones. DOE

N83-28560# Department of Energy, Bartlesville, Okla. Energy Technology Center.
OUTLOOK FOR ENHANCED OIL RECOVERY
Harry R. Johnson 1982 10 p refs Presented at the Enhanced Oil Recovery Conf., New Orleans, 3-4 Feb. 1982
(DE82-010464; DOE/BETC/OP-82/4; CONF-820213-1) Avail: NTIS HC A02/MF A01

The potential for enhanced oil recovery, the evolutionary nature of the recovery processes applied in oilfields today, key parameters that describe the technology state-of-the-art for each of the major oil recovery processes, and the nature and key outputs from the current Department of Energy research program on enhanced oil recovery were reviewed. The DOE program is focused on the analysis of ongoing tests and on long range, basic research to support a more thorough understanding of oil process performance. Data from the program will be made available through reports, symposia, and online computer access; the outputs are designed to allow an independent producer to evaluate his own project as an effort to transfer rapidly the technology now being developed. DOE

N83-28561# Cliffs Minerals, Inc., Granville, W. Va.
ANALYSIS OF THE DEVONIAN SHALES IN THE APPALACHIAN BASIN. VOLUME 2: APPENDICES
Sep. 1982 328 p refs 2 Vol.
(Contract DE-AC21-80MC-14693)
(DE83-003035; DOE/MC-14693/1296-Vol-2) Avail: NTIS HC A15/MF A01

Thirty three wells were core drilled from 1975 through 1981 for the Eastern Gas Shales Project in the Appalachian Basin. All the fracture data, mechanical characterization tests, stratigraphic projections, geologic structural interpretations, and gas production information were compiled. The well summary charts contain the detailed fracture distributions and mechanical test results for the stratigraphic members cored. The gamma ray log and density log are reproduced on each chart to show the correlation to stratigraphic members of the Devonian Shale sequence. Data were collected to define the relationship of radioactivity to the individual shale members. Temperature and noise logs are included to show zones of gas emanation in the well bore. The mechanical test results columns include pretest fractures in the samples, maximum ultrasonic velocity directions, orientation of cracks from point load tests, weakest tensile strength directions from directional tests, and crack orientations from hydrofracture tests when available. DOE

N83-28562# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany). Abteilung Fernerkundung.
DIGITAL PROCESSING OF LANDSAT DATA FOR THE PREPARATION OF A LAND USE MAP OF THE RURAL DISTRICT SURROUNDING TUEBINGEN TO A SCALE OF 1: 50,000
Helmut Richard Goetting Mar. 1982 92 p refs In GERMAN; ENGLISH summary Report will also be announced as translation (ESA-TT-816); original contains color illustrations
(DFVLR-FB-82-30; ESA-TT-816) Avail: NTIS HC A05/MF A01; DFVLR, Cologne DM 44,20

A 1: 50,000 land use map of the rural district Tuebingen was deduced from a 1975 LANDSAT scene using Dibias, an interactive digital image processing system for image processing. Algorithms for geometrical rectification to Gauss-Krueger-Krueger coordinates and the maximum-likelihood classification of the data are employed. Results are combined with optical and digital topographical information and are compared with a conventional vegetation map. Usefulness for regional planning is assessed. Author (ESA)

N83-28563# Sheffield Univ. (England).
THE EFFECT OF LARGE-SCALE STRUCTURES ON THE STABILITY OF COAL-FACE STEERING
J. B. Edwards and J. Kibble (National Coal Board Mining Research and Development Establishment) Sep. 1982 37 p refs Submitted for publication Sponsored by National Coal Board Mining Research and Development Establishment
(RR-195) Avail: NTIS HC A03/MF A01

Simplified models of piecewise rigid support structures for powerloaders operating on longwall coalfaces are shown to be analyzable by z-transform methods. Such analysis predicts that increasing the length of the structure's subsections sufficiently (compared to the inherent delay within the machine's vertical steering system) stabilizes the vertical steering of the entire coal face. Increasing the width of the structure to embrace more than two consecutive cut floors is shown to eliminate the need for electronic tilt-feedback in control systems. These analytical predictions are shown to hold good in detailed simulations of the system. An increase in the size of support-structure segments can potentially reduce the complexity of steering control systems. The size increase must be substantial (4 to 5 times the conventional size). Author (ESA)

N83-28564# Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
EVALUATION OF THE EFFECTIVENESS OF HYDROGEN AND OXYGEN ISOTOPES USED IN CONCERT WITH CHEMICAL WATER-QUALITY PARAMETERS AS INDICATORS OF SUBSURFACE WATER MOVEMENT AND SOURCE
Timothy W. Thurnblad, Harold W. Bentley, and David K. Kreamer Sep. 1982 143 p refs
(PB83-150029; W83-01633; OWRT-A-103-ARIZ(1)) Avail: NTIS HC A07/MF A01 CSCL 08H

A multiuse area, 15 miles south of Tucson, Arizona was selected to test a water pollution source assessment technique emphasizing the combined study of stable isotopes of water, major anions and cations, trace elements, pH, specific conductance, and water temperature. Computer based analytical techniques were developed to identify data patterns indicating effects of recharge sources. The range in isotopic ratios along the study transect

suggested that tracing surface water recharge by its isotopic signature is possible, if density and frequency of sampling are sufficient. At some sites, water quality parameters were found to exceed state drinking water supply standards. High sulfate concentrations were found in the surface water of mines pits and tailings ponds. GRA

N83-28565# Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
DEVELOPING A NEW DECONVOLUTION TECHNIQUE TO MODEL RAINFALL-RUNOFF IN ARID ENVIRONMENTS Report, 1 Oct. 1977 - 30 Sep. 1978
S. P. Neuman, S. D. Resnick, and R. W. Peebles Sep. 1982 9 p refs
(Contract DI-14-34-0001-8003)
(PB83-150318; W83-01627; OWRT-A-086-ARIZ(1)) Avail: NTIS HC A02/MF A01 CSCL 08H

Noisy rainfall runoff records of short duration are encountered in arid environments where rainfall often occurs in short isolated bursts and the data are measured with a considerable margin of error. Known noise was superimposed on synthetic rainfall runoff data to examine the ability of the Neuman-de Marsily deconvolution method to estimate the correct impulse response of the system when the data include only a single storm event. Approximately 50 Monte Carlo simulation runs were performed for each of three different noise models. It is demonstrated that the deconvolution model leads to reliable estimates and can be used in the presence of realistic noise levels. GRA

N83-28566# Geological Survey, Oklahoma City, Okla. Water Resources Div.
PRELIMINARY PROJECTIONS OF THE EFFECTS OF CHLORIDE-CONTROL STRUCTURES ON THE QUATERNARY AQUIFER AT GREAT SALT PLAINS, OKLAHOMA Final Report
J. E. Reed Jan. 1981 52 p refs Prepared in cooperation with the Corps of Engineers, Tulsa, Okla.
(PB83-151431; USGS/WRD/WRI/82-077; USGS/WRI-80-120) Avail: NTIS HC A04/MF A01 CSCL 08H

About 1,200 tons of chloride per day are added to the salt load of the Salt Fork Arkansas River at Great Salt Plains Lake from brine discharge from the rocks of Permian age in the vicinity of the lake. The U.S. Army Corps of Engineers has planned a chloride-control project. The Corps requested that the U.S. Geological Survey use a digital model to project the effects of the chloride-control structures on ground water. Ground water flow and ground-water transport models were calibrated to represent the Quaternary aquifer. Although ground-water levels are projected to rise as much as 19 feet in areas near three reservoirs, changes in ground-water level caused by the project will be small throughout most of the area. Author (GRA)

N83-28567# Kerr (Robert S.) Water Research Center, Ada, Okla.
RESEARCH FOR GROUNDWATER QUALITY MANAGEMENT
Clinton W. Hall, Marvin D. Piwoni, and Wayne A. Pettyjohn (Oklahoma State Univ.) 1983 58 p refs Submitted for publication
(PB83-152256; EPA-600/D-83-002) Avail: NTIS HC A04/MF A01 CSCL 08H

Ground water is an excellent resource due to its quality and availability. It is available at almost any location in quantitites large enough to provide for domestic needs and over one third of the country is underlain by aquifers capable of yielding 100,000 gallons or more daily on a sustained basis. This expansive nature of ground water is paradoxical in terms of its ability to meet water supply requirements over long periods of time. A ground water research strategy is presented which divides research considerations into three areas based on the types of processes that will effect pollutant movement in the subsurface: (1) hydrologic; (2) abiotic; and (3) biotic processes. GRA

N83-28568# Wisconsin Dept. of Natural Resources, Madison.
AUTOMATIC WATER QUALITY MONITORING OF THE FOX AND WISCONSIN RIVERS, 1972-1981 Final Report
Haven W. Weckwerth and Bruce A. Fenske Nov. 1982 327 p refs
(PB83-154104) Avail: NTIS HC A15/MF A01 CSCL 08H

The automatic water quality monitoring system for the Lower Fox River and the Wisconsin River was installed in 1970-71. The system consists of 11 stations, five on the Fox River and six on the Wisconsin River. Two basic systems of flow are utilized. One system uses the head of the water source to supply a continuous flow to the monitor. The monitor in this installation is located below the source water level. The other system uses a nonsubmersible pump to lift the water to the water monitor. GRA

N83-28569# Geological Survey, Tallahassee, Fla. Water Resources Div.
WATER RESOURCES AND DATA-NETWORK ASSESSMENT OF THE MANASOTA BASIN, MANATEE AND SARASOTA COUNTIES, FLORIDA
David P. Brown Nov. 1982 89 p refs Prepared in cooperation with the Southwest Florida Water Management District
(PB83-156653; USGS/WRD/WRI/83-002; USGS/WRI-82-37) Avail: NTIS HC A05/MF A01 CSCL 13B

The average annual rainfall in the Manasota Basin is 53.7 inches, and annual evapotranspiration is about 39 inches. Annual runoff from gaged parts of the Basin ranges from about 13 to 17 inches per year. Streamflow in the upland areas diminishes rapidly following the end of the rainy season and approaches zero during extended dry periods. Generally, surface water is of good quality except in tidally affected, coastal areas. The principal hydrogeologic units are the surficial aquifer, the upper confining beds and minor artesian aquifers, the Floridan aquifer, and the lower confining bed. Development and completion of the monitoring plan could provide most of the data necessary to define groundwater system. Author (GRA)

N83-28570# Economic Research Service, Washington, D. C.
CROPLAND TRENDS ACROSS THE NATION
James Horsfield and Norman Landgren Dec. 1982 25 p
(PB83-125542; AER-494) Avail: NTIS HC A02/MF A01 CSCL 02B

Global agricultural demand spurred expansion of U.S. cropland use over the last decade to a record 391 million acres in 1981, 4 million acres more than the previous record established in 1949. The contraction of cropland use after and subsequent expansion in the seventies was accompanied by major regional shifts in the pattern of agricultural land use revealed by analysis of county data over the period 1949-78. Factors such as regional comparative advantage and natural resource development triggered regional expansion and contraction of cropland use. GRA

N83-28571# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Biology.
ALTERED HYDROLOGY OF THE MISSOURI RIVER AND ITS EFFECTS ON FLOODPLAIN FOREST ECOSYSTEMS
W. Carter Johnson, Peggy W. Reily, L. Scott Andrews, James F. McLellan, and John A. Brophy (North Dakota State Univ.) Nov. 1982 88 p refs
(PB83-150110; VPI-VWRRC-BULL-239; W83-01603; OWRT-B-108-VA(A)) Avail: NTIS HC A05/MF A01 CSCL 02F

A river system's hydrologic regimen, altered by the construction and operation of a floodplain protection project, was long suspected of having major, long-term effects on the natural dynamics of riparian ecosystems that remain in gaps between large reservoirs. The hypothesis was confirmed by documenting some of those impacts in an area between Garrison Dam and Oahe Reservoir on the Missouri River in south-central North Dakota. Specifically, it examines post-dam changes in river meandering rate, floodplain forest composition, tree population structure, and tree growth rate. Results should have application to forests on other floodplains where the natural hydrologic regimen was altered by man. GRA

N83-28572# Rocky Mountain Forest and Range Experiment Station, Fort Collins, Colo.
PRECIPITATION AND TEMPERATURE CHARACTERISTICS OF

FORESTED WATERSHEDS IN CENTRAL AMERICA Final Technical Report
Ralph E. Campbell and Michael G. Ryan Oct. 1982 16 p refs (PB83-150482; FSGTR-RM-93) Avail: NTIS HC A02/MF A01 CSCL 02F

Precipitation and temperature characteristics of the Utah and alligator juniper woodlands and ponderosa pine forest types, on the Beaver Creek experimental watersheds, are described using 23 years of record. The climatic patterns, both precipitation and temperature, are quite representative of similar vegetation types and fit into a continuum with Arizona and New Mexico. GRA

N83-28016# Joint Publications Research Service, Arlington, Va.
EARTH'S NATURAL RESOURCES IN MANNED FLIGHTS OF INTERCOSMOS PROGRAM
V. V. Arkhipov *In its* USSR Rept.: Space, No. 21 (JPRS-83430) 9 May 1983 p 30-36 Transl. into ENGLISH from Zemlya i Vselennaya (Moscow), no. 2, Mar. - Apr. 1982 p 20-28 (For primary document see N83-28011 17-12)
Avail: NTIS HC A07

44 ENERGY PRODUCTION AND CONVERSION

Includes specific energy conversion systems, e.g., fuel cells and batteries; global sources of energy; fossil fuels; geophysical conversion; hydroelectric power; and wind power.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *85 Urban Technology and Transportation.*

N83-28573* National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
SOLAR DRIVEN LIQUID METAL MHD POWER GENERATOR Patent
Ja H. Lee (Vanderbilt Univ., Nashville, Tenn.) and Frank Hohl, inventors (to NASA) (Vanderbilt Univ., Nashville) Issued 14 Jun. 1983 7 p Filed 15 May 1981 Supersedes N81-32609 (19 - 23, p 3215) Sponsored by NASA
(NASA-Case-LAR-12495-1; US-Patent-4,388,542;
US-Patent-Appl-SN-263830; US-Patent-Class-310-11) Avail: US Patent and Trademark Office CSCL 10A

A solar energy collector focuses solar energy onto a solar oven which is attached to a mixer which in turn is attached to the channel of a MHD generator. Gas enters the oven and a liquid metal enters the mixer. The gas/liquid metal mixture is heated by the collected solar energy and moves through the MHD generator thereby generating electrical power. The mixture is then separated and recycled.

Official Gazette of the U.S. Patent and Trademark Office

N83-28574* National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
STIRLING CYCLE CRYOGENIC COOLER Patent
Max G. Gasser, Allan Sherman, Philip A. Studer, Alexander Daniels, and Michael P. Goldowsky, inventors (to NASA) Issued 28 Jun. 1983 14 p Filed 2 Oct. 1981 Supersedes N80-26571 (18 - 17, p 2261)
(NASA-Case-LAR-12697-1; US-Patent-4,389,849;
US-Patent-Appl-SN-308204; US-Patent-Class-62-6;
US-Patent-Class-308-10; US-Patent-Class-310-15;
US-Patent-Class-417-417) Avail: US Patent and Trademark Office CSCL 10B

A long lifetime Stirling cycle cryogenic cooler particularly adapted for space applications is described. It consists of a compressor section centrally aligned end to end with an expansion section, and respectively includes a reciprocating compressor piston and displacer radially suspended in interconnecting cylindrical housings by active magnetic bearings and has adjacent reduced clearance regions so as to be in noncontacting relationship therewith and wherein one or more of these regions operate as clearance seals. The piston and displacer are reciprocated in their housings by linear drive motors to vary the volume of respectively adjacent compression and expansion spaces which contain a gaseous working fluid and a thermal regenerator to effect Stirling cycle cryogenic cooling.

Official Gazette of the U.S. Patent and Trademark Office

N83-28575 North Carolina State Univ., Raleigh.
GROWTH AND CHARACTERIZATION OF THIN FILM ZINC-SILICON-ARSENIDE FOR SOLAR CELLS Ph.D. Thesis
Gabriel Agwu Igwe 1982 141 p
Avail: Univ. Microfilms Order No. DA8226655

Conditions for good morphology synthesis and epilayer growth of thin film Zinc Silicon Arsenide (ZnSiAs2) by the metallorganic chemical vapor deposition (MO-CVD) technique have been investigated. Structural, electrical and optical properties of such ZnSiAs2 layers were studied using several diverse methods including electron microprobe, X-ray diffraction, auger electron spectroscopy, secondary ion mass spectrometry, electron beam induced currents, photovoltaic spectral response, current-voltage and capacitance-voltage characteristics of heterostructures. Many problems generally associated with heteroepitaxial growth of semiconducting materials were much in evidence. In particular, interfacial diffusion resulting in autodoping of both substrate and the grown epilayer precluded rectifying heterojunction formation for ZnSiAs2 layers grown on Ge, GaAs or Si substrate. The lattice mismatch of about three percent between silicon and ZnSiAs2 provided additional problems of microcracks in and nonadherence of the epilayers. Dissert. Abstr.

N83-28576 Florida Univ., Gainesville.
STUDIES OF P/N JUNCTION POLYSILICON SOLAR CELLS Ph.D. Thesis
Franklin Noel Gonzalez 1982 169 p
Avail: Univ. Microfilms Order No. DA8226388

Experimental and analytical methods are developed for investigating the properties and performance degrading mechanisms of p/n junction polysilicon solar cells. A theoretical analysis of the multidimensional bulk recombination current at the grain boundaries (GBs) is developed. The basic assumption on which the analysis is based is that the surface recombination velocity at the GBs in the bulk (SGB) is constant. Two models are presented. The first one is aimed to the experimental determination of the values of SGB using special test structures of small size. The second model is intended to provide a theoretical estimate of the degradation in the electrical performance of small grain material. A solar cell structure is presented. This structure, called the quasi-grain boundary free polycrystalline solar cell, is intended to drastically reduce all the degrading effects due to the GBs.
Dissert. Abstr.

N83-28577 Colorado Univ., Boulder.
BIOMASS ALCOHOLS AS POTENTIAL PETROLEUM ALTERNATIVES IN THE FUEL AND PETROCHEMICAL INDUSTRIES: A GENERALIZED NETWORK MODEL Ph.D. Thesis
Ronald Francis Farina 1982 224 p
Avail: Univ. Microfilms Order No. DA8229828

A generalized network model called PETNET is developed to address this problem. The focus of the analysis presented is the role of biomass alcohols as potential alternatives to fossil hydrocarbons as raw materials in the petrochemical and oil industries. Illustrative scenarios for biomass-based alcohol replacements are investigated with PETNET by solving for alternative assumptions of price, capacity, resource availability and process technology. Dissert. Abstr.

N83-28578 Mississippi State Univ., State College.
SURFACE INFLUENCES ON THE CHARACTERISTIC PERFORMANCE OF THE SALT GRADIENT SOLAR POND. AN EXPERIMENTAL STUDY Ph.D. Thesis
Chinyere Okechi Onwubiko 1982 177 p

Avail: Univ. Microfilms Order No. DA8227553

The success of the Solar Pond as a device for collecting and storing solar energy depends on, among other factors, the maintenance of a stable density gradient above the storage zone. The effects of evaporation and surface temperature variations on the performance of the pond were studied. Two laboratory solar ponds were used so as to easily control these factors. The effect of evaporation was studied by suppressing evaporation in one of the ponds. The surface temperature was varied from 55 F to 37 F. Horizontal temperature variations were also investigated. An equation for predicting the temperature difference between covered and uncovered ponds in this storage zone was developed. In order to have a basis for comparison of the experimental results, a two-dimensional heat conduction model was formulated for the nonconventive zone and its solution was obtained by a finite difference technique. A one-dimensional model that was previously developed was also used for the purpose of comparison. In both models, there was close agreement betwen the experimental results and the prediction of the mathematical models.

Dissert. Abstr.

N83-28579 Colorado State Univ., Fort Collins.
COST AND PERFORMANCE EVALUATION OF TERRESTRIAL SOLAR THERMAL POWER SYSTEMS Ph.D. Thesis
Nabil ElGabalawi 1982 367 p
Avail: Univ. Microfilms Order No. DA8227917

A cost optimization model was developed based on relating systems costs to performance and minimizing the system electric energy production costs. The model was applied to systems representing major categories of solar thermal power systems such as the central receiver, the parabolic dish, the line-focusing and the fixed orientation focusing collectors. Several types of engines and energy storage systems were included in the analysis. Energy cost comparisons and sensitivities to system cost and performance parameters were analyzed for several plant sizes. A dynamic simulation model was also developed for the parabolic dish-Brayton system based on detailed system performance analysis and subsystem interfaces. The model was used to establish the system's performance characteristics over a wide range of insolations, engine speeds and temperatures. System performance variations due to the effect of reflector surface accuracy and receiver aperture as well as ambient conditions were included in the study. Transient performance and system response to large variations in insolation were also investigated for the development of stable feedback control systems. Dissert. Abstr.

N83-28580*# Faucett (Jack) Associates, Inc., Chevy Chase, Md.
ENERGY AND PRECIOUS FUELS REQUIREMENTS OF FUEL ALCOHOL PRODUCTION. VOLUME 4: APPENDICES G AND H, METHANOL FROM COAL Final Report
Herbert Weinblatt, Geoffrey Back, and T. S. Reddy (Battelle Columbus Labs., Ohio) Dec. 1982 68 p refs
(Contracts DEN3-292; DE-AI01-81CS-50006)
(NASA-CR-168093; DOE/NASA/0292-1; NAS 1.26:168093; JACKFAU-82-299-Vol-4) Avail: NTIS HC A04/MF A01 CSCL 10A

Coal mine location, mining technology, energy consumption in mining, coal transport, and potential availability of coal are discussed. Methanol from coal is also discussed. Author

N83-28581*# Faucett (Jack) Associates, Inc., Chevy Chase, Md.
ENERGY AND PRECIOUS FUELS REQUIREMENTS OF FUEL ALCOHOL PRODUCTION, VOLUME 1 Final Report
Herbert Weinblatt, Michael F. Lawrence, and David Jenkins Dec. 1982 87 p refs Prepared in cooperation with Battelle Columbus Labs. 3 Vol.
(Contracts DEN3-292; DE-AI01-81CS-50006)
(NASA-CR-168090; DOE/NASA/0292-1; NAS 1.26:168090; JACKFAU-82-299-Vol-1) Avail: NTIS HC 05/MF A01 CSCL 10A

Ethanol from grain, methanol from cellulose, and methanol from coal are considered. Author

N83-28582*# Faucett (Jack) Associates, Inc., Chevy Chase, Md.
ENERGY AND PRECIOUS FUELS REQUIREMENTS OF FUEL ALCOHOL PRODUCTION. VOLUME 2, APPENDICES A AND B: ETHANOL FROM GRAIN Final Report
Herbert Weinblatt, T. S. Reddy (Battelle Columbus Labs.), and Anthony Turhollow, Jr. (Iowa State Univ.) Dec. 1982 78 p refs 3 Vol.
(Contracts DEN3-292; DE-AI01-81CS-50006)
(NASA-CR-168091; DOE/NASA/0292-1; NAS 1.26:168091; JACKFAU-82-299-Vol-2) Avail: NTIS HC A05/MF A01 CSCL 10A

Energy currently used in grain production, the effect of ethanol production on agricultural energy consumption, energy credits for ethanol by-products, and land availability and the potential for obtaining ethanol from grain are discussed. Dry milling, wet milling, sensitivity analysis, potential for reduced energy consumption are also discussed. Author

N83-28583*# Faucett (Jack) Associates, Inc., Chevy Chase, Md.
ENERGY AND PRECIOUS FUELS REQUIREMENTS OF FUEL ALCOHOL PRODUCTION. VOLUME 3, APPENDICES C TO F: METHANOL FROM CELLULOSE Final Report
Rena Margulis, Geoffrey Back, Karen St.John, and T. S. Reddy Dec. 1982 119 p refs Prepared in cooperation with Battelle Columbus Labs. 3 Vol.
(Contracts DEN3-292; DE-AI01-81CS-50006)
(NASA-CR-168092; DOE/NASA/0292-1; NAS 1.26:168092; JACKFAU-82-299-Vol-3) Avail: NTIS HC A06/MF A01 CSCL 10A

Forest residues, silvicultural biomass farms, agricultural residues, and methanol from cellulosic feedstocks are discussed. Author

N83-28584# Westinghouse Electric Corp., Pittsburgh, Pa. Energy Conversion Branch.
US AIR FORCE FUEL CELL APPLICATION ANALYSIS Final Report, 1 Sep. 1980 - 1 Jan. 1982
W. D. Pouchot, W. A. Summers, and J. A. Hofbauer Wright Patterson AFB, Ohio AFWAL Jan. 1982 450 p refs
(Contract F33615-80-C-2038; AF Proj. 3145)
(AD-A126121; WAESD-TIME-3134; AFWAL-TR-82-2004) Avail: NTIS HC A19/MF A01 CSCL 10/2

Fuel Cell Power Unit conceptual designs and cost/benefit analyses were accomplished for six U.S. Air Force applications. The applications included two attended remote sites, two unattended remote sites and two tactical/mobile requirements. The electrical power ratings of these designs ranged from 23 kW to 100 kW. Fuels considered included diesel, Jet Fuel (JP-4) and methanol. Life cycle cost and benefit analyses showed that significant savings and operational improvements could be realized with the introduction of fuel cells into the USAF power generation inventory. Author (GRA)

N83-28585# Army Construction Engineering Research Lab., Champaign, Ill. Energy Systems Div.
SOLFEAS: AN INTERACTIVE PROGRAM FOR ESTIMATING THE ECONOMIC FEASIBILITY OF AN ACTIVE SOLAR THERMAL ENERGY SYSTEM Final Report
David M. Joncich and C. W. Sohn Jan. 1983 72 p refs
(DA Proj. 4A7-62781-AT-45)
(AD-A125682; CERL-TR-E-180) Avail: NTIS HC A04/MF A01 CSCL 09/2

SOLFEAS is an interactive computer program developed to provide Corps of Engineers Field Operating Agencies (FOAs) with a simple, inexpensive means of estimating the economic feasibility of an active solar thermal energy system. SOLFEAS can project paybacks for each of four solar system types: (1) service water heating/preheating (domestic hot water and/or process hot water), (2) space heating only, (3) combined space - service water heating, and (4) combined space service water heating/space cooling.

Author (GRA)

N83-28586# Courtesy Associates, Inc., Washington, D.C.
PROCEEDINGS OF THE DOE PHYSICAL AND CHEMICAL ENERGY STORAGE ANNUAL CONTRACTORS' REVIEW MEETING
Dec. 1982 592 p refs Meeting held in Arlington, Va., 23-26 Aug. 1982
(Contract DE-AC02-76CH-00016)
(DE83-004756; CONF-820827) Avail: NTIS HC A25/MF A01

The goals and accomplishments of energy systems and storage projects are described. The specific technology areas include chemical/hydrogen energy systems, underground energy storage, superconducting magnetic energy storage, mechanical energy storage, solar thermal energy storage, and thermal energy storage for building heating and cooling and industrial applications. For individual titles, see N83-28587 through N83-28634.

N83-28587# Solar Turbines International, San Diego, Calif.
METAL HYDRIDE/CHEMICAL HEAT PUMP DEVELOPMENT PROGRAM (PART 1 AND PART 2)
Theresa A. Argabright, David A. Rohy, and Hector A. Madariaga (Southern California Gas Co.) *In* Courtesy Assoc., Inc. Proc. of the DOE Phys. and Chem. Storage Ann. Contractors' Rev. Meeting Dec. 1982 p 7-14 (For primary document see N83-28586 17-44)
Avail: NTIS HC A25/MF A01

The development and demonstration of a metal hydride heat pump (MHHP) are discussed. The concept is based on the ability of selected metals to absorb and desorb hydrogen without the consumption of metal or hydrogen. The MHHP can be tailored to provide heating and/or cooling, or temperature upgrading over a wide range of temperatures and, thus, can be used with a variety of heat sources. Because the MHHP is a cyclical device, heat transfer is considered to be the key technical study area. High heat transfer leads to rapid cycling, high capacity, low hydride inventory per unit output and low system costs. Due to the cyclic nature of this device, the porasitic self heating and cooling losses of the structure must be reduced. Therefore, the goal of this project is to provide high heat transfer with a low mass unit. M.G.

N83-28588# Rocket Research Corp., Redmond, Wash.
THE SULFURIC ACID/WATER CHEMICAL HEAT PUMP PROGRAM
E. Charles Clark and Thomas R. Duranti *In* Courtesy Assoc., Inc. Proc. of the DOE Phys. and Chem. Storage Ann. Contractors' Rev. Meeting Dec. 1982 p 15-20 refs (For primary document see N83-28586 17-44)
Avail: NTIS HC A25/MF A01

The verification test unit (VTU) designed, built and demonstrated during the previous contract was tested extensively. System performance measurements using a single simulated waste heat source were completed and tests using two simulated heat sources of differing temperatures are nearing completion. System thermal COP's (coefficient of performance) ranged from 0.1 to 0.3 during the single source tests. Steady temperature amplification of 60 to 90 F was repeatedly achieved. Preparations are under way to conduct an extended duration test with a total operation time of 100 hours. M.G.

N83-28589# TRW, Inc., McLean, Va. Energy and Environmental Div.
COST AND ENERGY-EFFECTIVENESS OF CHEMICAL HEAT PUMPS FOR INDUSTRIAL PROCESS HEAT APPLICATIONS
Warren R. Standley *In* Courtesy Assoc., Inc. Proc. of the DOE Phys. and Chem. Storage Ann. Contractors' Rev. Meeting Dec. 1982 p 21-25 refs (For primary document see N83-28586 17-44)
Avail: NTIS HC A25/MF A01

Cost and energy effectiveness of the sulfuric acid chemical heat pump (CHP) for recovering industrial waste heat and supplying useful process heat is assessed. A previous study of CHPs has indicated that the most effective application for the CHP technologies is very likely in the industrial sector. The current study expands on that conclusion by developing detailed analyses of the sulfuric acid CHP in specific industrial applications. The applications are selected to be recognizable to a broad audience of industrial energy managers and decision makers, and the analysis is conducted in such a manner as to present that audience with technical and economic parameters with which they are familiar. Author

N83-28590# Silverstein (Calvin C.) Associates, Bethel Park, Pa.
THE OHZ HYDROGEN PROCESS
Calvin C. Silverstein *In* Courtesy Assoc., Inc. Proc. of the DOE Phys. and Chem. Storage Ann. Contractors' Rev. Meeting Dec. 1982 p 26-30 refs (For primary document see N83-28586 17-44)
Avail: NTIS HC A25/MF A01

The oxygen-hydrogen-zeolite (OHZ) hydrogen process, discovered by Rasai and Bishop, represents a truly unique approach to hydrogen production. The ionizing capability of zeolite cations is utilized to decompose water into hydrogen and oxygen in two thermally distinct steps, which take place in the same bed of zeolite particles. The evaluation of the OHZ process reported confirms the attractiveness of the process, and identifies key process goals for commercial viability. It is concluded that further development of the OHZ process is warranted. DOE

N83-28591# General Atomic Co., San Diego, Calif.
THE SULFUR-IODINE THERMOCHEMICAL WATER-SPLITTING CYCLE
G. E. Besenbruch, J. H. Norman, L. C. Brown, D. R. O'Keefe, M. Endo, and C. L. Allen *In* Courtesy Assoc., Inc. Proc. of the DOE Phys. and Chem. Storage Ann. Contractors' Rev. Meeting Dec. 1982 p 31-35 (For primary document see N83-28586 17-44)
Avail: NTIS HC A25/MF A01

Experimental work was carried out on process improvement concepts, resulting in an advanced process for treatment of the lower phase (H_2O-HI-I_2) and a liquid HI decomposition process utilizing homogeneous catalysis. Bench scale testing of design improvements was successfully carried out. A flowsheet for a solar thermal powered sulfur iodine water splitting process was developed and a cost estimate for hydrogen production completed. Author

N83-28592# SRI International Corp., Menlo Park, Calif.
RECOVERY OF HYDROGEN FROM HYDROGEN SULFIDE
Gopala N. Krishnan and Donald L. Hilenbrand *In* Courtesy Assoc., Inc. Proc. of the DOE Phys. and Chem. Storage Ann. Contractors' Rev. Meeting Dec. 1982 p 36-41 refs (For primary document see N83-28586 17-44)
Avail: NTIS HC A25/MF A01

A bench scale study was conducted to examine the rate of reaction of hydrogen sulfide with liquid copper for the purpose of recovering hydrogen from hydrogen sulfide. It was found that the reaction rate at 1200 C was rapid and that the conversion of hydrogen sulfide to hydrogen approached the equilibrium level of 99.7%. The rate and the conversion remained constant until nearly all the copper was converted to cuprous sulfide. Using a model based on the Cu-S phase diagram, it was concluded that the gas phase mass transport was the rate controlling step during most of the reaction period. Preliminary technical and economic assessments were performed for a hydrogen recovery process based on liquid copper and cuprous sulfide intermediates. M.G.

N83-28593# Battelle Columbus Labs., Ohio.
HYDROGEN EMBRITTLEMENT OF STEEL PIPELINES **c26**
John H. Holbrook, H. J. Cialone, and M. E. Mayfield *In* Courtesy Assoc., Inc. Proc. of the DOE Phys. and Chem. Storage Ann. Contractors' Rev. Meeting Dec. 1982 p 42-47 (For primary document see N83-28586 17-44)
Avail: NTIS HC A25/MF A01

The impact of hydrogen embrittlement on pipeline transmission of hydrogen is discussed. It was confirmed that hydogen gas increases dramatically the fatigue crack growth in pipeline steels. Also hydrogen acceleration of the fatigue crack growth rate decreases at large values of R ratio such as would be produced by moderate variations in operating pressure. It was found that sustained load subcritical crack growth does occur in heat affected zones of typical pipeline welds but only at stress intensities that would not normally be encountered in service. M.G.

N83-28594# Brookhaven National Lab., Upton, N. Y.
A TEST BED FOR ADVANCED HYDROGEN TECHNOLOGY PHOTOVOLTAIC ARRAY/ELECTROLYZER SYSTEM c28
Gerald Strickland *In* Courtesy Assoc., Inc. Proc. of the DOE Phys. and Chem. Storage Ann. Contractors' Rev. Meeting Dec. 1982 p 48-52 ref (For primary document see N83-28586 17-44)
Avail: NTIS HC A25/MF A01

The development of an integrated test bed that will demonstrate a hydrogen production technology consisting of a photovoltaic array supplying electrical energy to an electrolyzer is discussed. The design of the experimental program leading to system evaluation is also described. M.G.

N83-28595# Brookhaven National Lab., Upton, N. Y.
CHEMICAL/HYDROGEN ENERGY SYSTEMS ANALYSIS
Morris Beller *In* Courtesy Assoc., Inc. Proc. of the DOE Phys. and Chem. Storage Ann. Contractors' Rev. Meeting Dec. 1982 p 53-56 refs (For primary document see N83-28586 17-44)
Avail: NTIS HC A25/MF A01

Four hydrogen energy technologies are addressed including: hydrogen recovery from hydrogen separation using hydride technology, photochemical hydrogen production, anode depolarization in electrolytic hydrogen production. DOE

N83-28596# Brookhaven National Lab., Upton, N. Y.
ADVANCED CONCEPTS FOR ELECTROLYTIC HYDROGEN PRODUCTION c28
James McBreen and C. Y. Yang *In* Courtesy Assoc., Inc. Proc. of the DOE Phys. and Chem. Storage Ann. Contractors' Rev. Meeting Dec. 1982 p 57-66 refs (For primary document see N83-28586 17-44)
Avail: NTIS HC A25/MF A01

Two methods for reducing the large voltage requirements of aqueous electrolysis are discussed: high temperature steam electrolysis in a solid oxide electrolyte electrolyzer at about 1000 C and electrolysis using anode depolarizers. M.G.

N83-28597# Life Systems, Inc., Cleveland, Ohio.
STATIC FEED WATER ELECTROLYSIS FOR LARGE SCALE HYDROGEN GENERATION c28
Franz H. Schubert, Andy J. Kovach, and Kenneth A. Burke *In* Courtesy Assoc., Inc. Proc. of the DOE Phys. and Chem. Storage Ann. Contractors' Rev. Meeting Dec. 1982 p 67-73 refs (For primary document see N83-28586 17-44)
Avail: NTIS HC A25/MF A01

The static feed water elctrolysis concept was evaluated for application to large scale hydrogen generation. The continued efforts addressed four areas: (1) verification of performance of the first 10 to 1 scaled up cell hardware (0.1 to 1.0 sq ft); (2) analysis of the data obtained with the 1.0 sq ft hardware and the development of a Model II 1.0 sq ft cell capable of high performance, multicell stack operation; (3) continuation of the development efforts to operate with impure water feed sources through testing at the 0.1 sq ft and 1.0 sq ft level as well as at elevated pressures (up to 200 psia); and (4) initiation of efforts to improve or maintain the present high performance levels, but at potentially reduced capital equipment and operational costs through elevated temperature operation and component/part cost reductions. M.G.

N83-28598# Teledyne Energy Systems, Timonium, Md.
ADVANCED ALKALINE WATER ELECTROLYSIS DEVELOPMENT OF AN ELECTROLYSIS CELL SEPARATOR FOR 125 C OPERATION c25
John N. Murray *In* Courtesy Assoc., Inc. Proc. of the DOE Phys. and Chem. Storage Ann. Contractors' Rev. Meeting Dec. 1982 p 74-79 refs (For primary document see N83-28586 17-44)
Avail: NTIS HC A25/MF A01

With the hydrogen technology for 1.7 to 1.75 volts/cell at 500 ma/cm(2), 1000 C demonstrated under previous contracts, the emphasis at Teledyne Energy Systems (TEC) during the last year was refocused onto the development of a mechanically stable electrode separator for operation at 1250 C. A separator was developed consisting of 20 V/o polybenzimidazole, 80 V/o potassium titanate which appears to satisfy the four separator requirements of low effective resistivity, small pore diameters, a high degree of natural wettability and chemical/mechanical stability in the application environment. Life testing of a two cell, 300 cm(2) active area module involving the best available technology was initiated in June, 1982 with the plan of operating approximately 2200 hours at 1250 C, 500 ma/cm(2) to demonstrate the stability of the technology. Additional investigations into the performance characteristics of the anode have been conducted and have offered new insight into gaining an additional 100 mV per cell. DOE

N83-28599# General Electric Co., Wilmington, Mass. Electrochemical Energy Conversion Program Office.
STATUS OF THE DEVELOPMENT OF SOLID POLYMER ELECTROLYTE WATER ELECTROLYSIS FOR LARGE SCALE HYDROGEN GENERATION c25
James F. McElroy *In* Courtesy Assoc., Inc. Proc. of the DOE Phys. and Chem. Storage Ann. Contractors' Rev. Meeting Dec. 1982 p 80-84 (For primary document see N83-28586 17-44)
Avail: NTIS HC A25/MF A01

During GFY 82, progress continued at General Electric in the development of Solid Polymer Electrolyte Water Electrolysis for Large Scale Hydrogen Generation. The joint Department of Energy, Electric Utility and General Electric Company sponsored program was aimed at performance improvement. A Technoeconomic Study was completed which quantified the cost of hydrogen from SPE water electrolyzers. In parallel, an Electric Power Research Institute/Public Service Electric and Gas Program concentrated on developing a prototype 500 SCFH system for field evaluation. This system has undergone 2000 hours of confirmation testing and has been delivered to Public Service Electric and Gas for field evaluation. DOE

N83-28600# California Univ., Berkeley. Lawrence Berkeley Lab.
NUMERICAL MODELING OF AQUIFER THERMAL ENERGY STORAGE
Chin Fu Tsang, C. Doughty, and C. T. Kincaid (Pacific Northwest Lab.) *In* Courtesy Assoc., Inc. Proc. of the DOE Phys. and Chem. Storage Ann. Contractors' Rev. Meeting Dec. 1982 p 91-95 (For primary document see N83-28586 17-44)
(Contract DE-AC03-76SF-00098)
Avail: NTIS HC A25/MF A01

During 1981 and 1982, Auburn University has been performing a three cycle ATES field experiment in Mobile County, Alabama. Details of the experiment are described elsewhere in this volume. Concurrent with the first two cycles (59 C and 82 C), Lawrence Berkeley Laboratory (LBL) did numerical simulations based on field operating conditions to predict the outcome of each cycle before its conclusion. Prior to the third cycle, a series of numerical simulations were made to aid in the design of an experiment that would yield the highest recovery factor possible. Author

N83-28601# Terra Tek, Inc., Salt Lake City, Utah.
FIELD AND LABORATORY STUDIES OF SUBSURFACE WATER INJECTION: SEASONAL THERMAL ENERGY STORAGE PROGRAM (STES)
Lawrence B. Owen, S. C. Blair (Battelle Pacific Northwest Lab.), and E. Peterson *In* Courtesy Assoc., Inc. Proc. of the DOE Phys. and Chem. Storage Ann. Contractors' Rev. Meeting Dec. 1982 p 96-105 (For primary document see N83-28586 17-44)
Avail: NTIS HC A25/MF A01

The Seasonal Thermal Energy Storage (STES) project office at the Battelle, Pacific Northwest Laboratory has sponsored development of an Aquifer Properties Test Facility (APTF) to evaluate the effects of thermal cycling on reservoir properties. The APTF Laboratory apparatus for testing aquifer materials at elevated temperature and pressure (Figure 1) is now being used to evaluate aquifer material from the University of Minnesota Field Test Facility (FTF). Injection well impairment has been experienced at STES sites in Mobile, Alabama and Stony Brook, New York. Terra Tek Research, under contract to Battelle, PNL, performed a laboratory evaluation of impairment mechanisms that may have

been involved in the failure of the injection well at the Stony Brook site. Terra Tek Research, again under contract to Battelle, PNL, designed, built and installed a portable Field Injectability Test Stand (FITS) at the STES Field Test Facility, University of Minnesota, St. Paul, Minnesota. The injectability apparatus uses membrane filters and core samples as injection formation analogs to evaluate the response of a representative porous matrix to injected water. Author

N83-28602# Alabama Univ., Tuscaloosa. Dept. of Mechanical Engineering.
MONITORING AND ANALYSIS OF A CHILL STORAGE SYSTEM
Walter J. Schaetzle (W. J. Schaetzle & Assoc., Inc.) and C. E. Brett *In* Courtesy Assoc., Inc. Proc. of the DOE Phys. and Chem. Storage Ann. Contractors' Rev. Meeting Dec. 1982 p 106-110 (For primary document see N83-28586 17-44)
Avail: NTIS HC A25/MF A01

Parisian, a major department store in University Mall, Tuscaloosa, Alabama, has a free cooling system installed to provide air conditioning. The system uses a cooling tower during cold weather, below 47 F Wet bulb temperature, to chill water to an average 43 F. The cold water is stored in an unconfined aquifer and recovered as required for air conditioning on an annual basis. This contract provides monitoring of this system to evaluate system performance. Instrumentation for monitoring has been selected and is being installed. Water temperatures and integrated flow entering and leaving the air conditioning cooling coils and the cooling tower are the prime measurements. Power input to all pumps and cooling tower is also measured. In addition, the temperatures leaving and entering the wells and near the bottom of the wells are measured at random intervals. The water levels in the wells are measured at similar times. Store and ambient data are also recorded. B.W.

N83-28603# Minnesota Univ., St. Paul.
UNIVERSITY OF MINNESOTA AQUIFER THERMAL ENERGY STORAGE FIELD TEST FACILITY
Matt Walton and Marcus C. Hoyer *In* Courtesy Assoc., Inc. Proc. of the DOE Phys. and Chem. Storage Ann. Contractors' Rev. Meeting Dec. 1982 p 111-115 (For primary document see N83-28586 17-44)
Avail: NTIS HC A25/MF A01

The University of Minnesota Aquifer Thermal Energy Storage (ATES) Field Test Facility became operational. Experiments demonstrated that the Franconia-Ironton-Galesville aquifer will accept injection of 300 gpm (18.9 1 sec (-1)) at reasonable pressures with a heat buildup in the injection well of about 44 psi (31.6 m) over 8 days. Heating of the ground water caused precipitation of carbonate in the piping and injection well, but with proper water conditioning, the system will work satisfactorily at elevated temperatures. Author

N83-28604# Auburn Univ., Ala. Dept. of Civil Engineering.
MOBILE FIELD TEST FACILITY
Joel G. Melville, Fred J. Molz, and Oktay Gueven *In* Courtesy Assoc., Inc. Proc. of the DOE Phys. and Chem. Storage Ann. Contractors' Rev. Meeting Dec. 1982 p 116-125 refs (For primary document see N83-28586 17-44)
Avail: NTIS HC A25/MF A01

The investigation of potential and application of the seasonal storage of energy as heated water in aquifers has increased in recent years. As energy costs increase aquifer storage can become a more important technique in reducing peak energy demands if aquifer thermal energy systems are clearly understood and utilized at maximum efficiency. Since 1976 Auburn University has conducted field tests in a confined aquifer near Mobile, Alabama. A set of three experimental cycles was begun in 2/17/81. This paper discusses the results of the first and second cycles of experiments. The description of the third, final cycle field procedure and preliminary injection phase data are also presented. B.W.

N83-28605# Dames and Moore, Cranford, N.J.
ANALYSIS OF REINJECTION PROBLEMS AT THE STONY BROOK ATES FIELD TEST SITE
Donald J. Supkow and James A. Shultz *In* Courtesy Assoc., Inc. Proc. of the DOE Phys. and Chem. Storage Ann. Contractors' Rev. Meeting Dec. 1982 p 126-130 (For primary document see N83-28586 17-44)
Avail: NTIS HC A25/MF A01

Aquifer Thermal Energy Storage (ATES) is one of several energy storage technologies being investigated by the DOE to determine the feasibility of reducing energy consumption by means of energy management systems. The State University of New York, (SUNY) Stony Brook, Long Island, New York site was selected by Battelle PNL for a Phase 1 investigation to determine the feasibility of an ATES demonstration to seasonally store chill energy by injecting chilled water in the winter and recovering it at a maximum rate of 100 MBTU/hr (30 MW) in the summer. The Phase 1 study was performed during 1981 by Dames & Moore under subcontract to Batelle PLN. The pumping and injection tests were performed using two wells in a doublet configuration. Well PI-1 is a previously existing well and PI-2 was installed specifically for this investigation. Both wells are screened in the Upper Magothy aquifer from approximately 300 to 350 feet below ground surface. Nine observation wells were also installed as a portion of the investigation to monitor water level and aquifer temperature changes during the test. B.W.

N83-28606# Minnesota Univ., St. Paul.
HEAT ACCUMULATION AND STORAGE CAPACITY OF THE WATER-FILLED MINES AT ELY, MINNESOTA
Matt Walton and Peter McSwiggen *In* Courtesy Assoc., Inc. Proc. of the DOE Phys. and Chem. Storage Ann. Contractors' Rev. Meeting Dec. 1982 p 131-135 (For primary document see N83-28586 17-44)
Avail: NTIS HC A25/MF A01

The iron mines at Ely occupy a doubly plunging isoclinal syncline with a nearly vertical axial plane, forming an irregular, canoe-shaped structure, striking about N.70 E., enclosed within massive Archean greenstone pillow lavas. A reasonably complete collection of mine maps and sections has been assembled from several sources to provide, at least for the present an adequate picture of the as-built configuration of the underground workings. No topographic data have been found to show the contour of the ground over the mines before subsidence, but it is clear that most of the depression occupied by Miners Lake is due to subsidence, and only a minor amount is due to open-pit mining at the western end of the deposit. Acoustic profiles of the lake, the U.S. Geological Survey 7-1/2-minute topographic map prepared before the water in the mines rose into the subsidence area, and enlarged aerial photographs taken at different dates during the filling of the mines are being studied to evaluate the subsidence of the mine and filling of the lake since 1965. B.W.

N83-28607# Argonne National Lab., Ill.
ICE PRODUCTION AND STORAGE FOR SEASONAL APPLICATIONS, UTILIZING HEAT PIPE TECHNOLOGY
Anthony J. Gorski and W. W. Schertz *In* Courtesy Assoc., Inc. Proc. of the DOE Phys. and Chem. Storage Ann. Contractors' Rev. Meeting Dec. 1982 p 136-140 refs (For primary document see N83-28586 17-44)
Avail: NTIS HC A25/MF A01

The objective of this program is to characterize the technical features of formation, collection and storage of ice naturally grown during winter months by means of innovative heat pipe technology. Author

N83-28608# Pacific Northwest Lab., Richland, Wash.
ANALYSIS AND ASSESSMENT OF STES TECHNOLOGIES
Daryl R. Brown, D. E. Blahnik, and H. D. Huber *In* Courtesy Assoc., Inc. Proc. of the DOE Phys. and Chem. Storage Ann. Contractors' Rev. Meeting Dec. 1982 p 141-146 (For primary document see N83-28586 17-44)
(Contract DE-AC06-76RL-01830)

Avail: NTIS HC A25/MF A01

Technical and economic assessments completed in FY 1982 in support of the Seasonal Thermal Energy Storage (STES) segment of the Underground Energy Storage Program included: (1) a detailed economic investigation of the cost of heat storage in aquifers, (2) documentation for AQUASTOR, a computer model for analyzing aquifer thermal energy storage (ATES) coupled with district heating or cooling, and (3) a technical and economic evaluation of several ice storage concepts. This paper summarizes the research efforts and main results of each of these three activities. In addition, a detailed economic investigation of the cost of chill storage in aquifers is currently in progress. The work parallels that done for ATES heat storage with technical and economic assumptions being varied in a parametric analysis of the cost of ATES delivered chill. The computer model AQUASTOR is the principal analytical tool being employed. B.W.

N83-28609# Louisiana State Univ., Baton Rouge. Inst. for Environmental Studies.

SALT STUDIES: CONCLUSIONS

Robert L. Thoms and R. M. Gehle *In* Courtesy Assoc., Inc. Proc. of the DOE Phys. and Chem. Storage Ann. Contractors' Rev. Meeting Dec. 1982 p 153-157 refs (For primary document see N83-28586 17-44)

Avail: NTIS HC A25/MF A01

This report represents the conclusion of the compressed air energy storage (CAES) program in salt. It includes a brief background of salt cavity studies and utilization for CAES, the focuses on long-term stability criteria for solution mined salt cavities. Summary statements are made on some of the more important criteria and their significance for operational peaking-power plants utilizing salt cavities for CAES reservoirs. The concluding section of this report incorporates a discussion of the future for CAES in U.S. salt deposits. This discussion is based mainly on technical considerations, since they have been the main consideration in this particular study. Obviously, economic analyses will dominate decisions by utilities on construction schedules for any technically feasible CAES study. Author

N83-28610# RE/SPEC, Inc., Rapid City, S. Dak.

HARDROCK STUDIES: CONCLUSIONS

Arlo F. Fossum *In* Courtesy Assoc., Inc. Proc. of the DOE Phys. and Chem. Storage Ann. Contractors' Rev. Meeting Dec. 1982 p 158-162 refs (For primary document see N83-28586 17-44) (Contract DE-AC06-76RL-01830)

Avail: NTIS HC A25/MF A01

The objective of the hard rock reservoir stability studies project was to develop geotechnical criteria for the design and stability of caverns in hard rock formations that would be used to store compressed air for utility load leveling operations. To develop these criteria, a sequence of studies was formulated including state-of-the-art assessment, numerical model development, and an experimental program. This sequence was started in FY 1978 and completed FY 1981. During FY 1982, final stability criteria and guidelines were assembled into a report that integrated the geotechnical data base obtained from the sequence of hard rock studies. This document provides a resource that can be used to address concerns regarding long-term cavern stability by those who are responsible for CAES development. Author

N83-28611# PB-KBB, Inc., Houston, Tex.

CAES IN AN AQUIFER: PITTSFIELD, ILLINOIS

John A. Istvan *In* Courtesy Assoc., Inc. Proc. of the DOE Phys. and Chem. Storage Ann. Contractors' Rev. Meeting Dec. 1982 p 163-168 (For primary document see N83-28586 17-44)

Avail: NTIS HC A25/MF A01

The operational analysis of the aquifer and air storage system under specific site conditions is documented. The air injection, heated air, and withdrawal cycle systems are described. The design of instruments for measuring air flow at 1250 sefm at a maximum pressure of 300 psiq and at a maximum temperature of 392 F is discussed as well as the programmable controller and microcomputer provided for monitoring and recording the surface instrumentation data. Surface instrumentation systems are discussed for measuring temperature, pressure, flow rate, humidity, and particulates. The automatic operation mode switchover system and the downhole instrumentation system are also considered. A.R.H.

N83-28612# Fluidyne Engineering Corp., Minneapolis, Minn.

THERMAL ENERGY STORAGE MEDIA FOR ADVANCED COMPRESSED AIR ENERGY STORAGE SYSTEMS

Lynn Marksberry *In* Courtesy Assoc., Inc. Proc. of the DOE Phys. and Chem. Storage Ann. Contractors' Rev. Meeting Dec. 1982 p 177-186 refs Sponsored in part by EPRI (For primary document see N83-28586 17-44)

Avail: NTIS HC A25/MF A01

Screening tests were performed to compare materials for thermal energy storage pebble media in advanced compressed air energy storage power plants. The effects of thermal cycling and bed weight on pebble deterioration were measured. Four materials were tested: Denstone fireclay, iron ore, basalt rock, and cast iron. Each was tested as a pebble bed 0.9 m (3 ft) in diameter and 4.6 m (15 ft) high. The beds were heated and cooled between 310 K (100 F) and 750 K (900 F) for four hours per cycle. The most significant result was the good performance of the basalt rock, which is also the lowest cost material by margin. Author

N83-28613# Argonne National Lab., Ill.

TECHNICAL AND ECONOMIC ANALYSIS OF ENERGY STORAGE

Joseph G. Asbury, Robert F. Giese, R. Mueller, A. Valentino, and W. Walsh *In* Courtesy Assoc., Inc. Proc. of the DOE Phys. and Chem. Storage Ann. Contractors' Rev. Meeting Dec. 1982 p 187-191 refs (For primary document see N83-28586 17-44)

Avail: NTIS HC A25/MF A01

The performance and cost of chilled water and ice storage systems in commercial buildings applications was evaluated. Paybacks of less than four years were estimated under rate schedules currently in force in many parts of the country. Three concepts for energy storage and transport that merit consideration for research and development support were identified: multicomponent slurries for enhanced heat transfer, transport, and storge; superconducting magnetic energy storage for fusion reactor applications; and polymer materials for thermal storage (especially seasonal) applications. Author

N83-28614# Los Alamos Scientific Lab., N. Mex.

THE 30 MJ SUPERCONDUCTING MAGNETIC ENERGY STORAGE FOR BPA TRANSMISSION LINE STABILIZER

John D. Rogers *In* Courtesy Assoc., Inc. Proc. of the DOE Phys. and Chem. Storage Ann. Contractors' Rev. Meeting Dec. 1982 p 193-196 refs (For primary document see N83-28586 17-44)

Avail: NTIS HC A25/MF A01

The stability of the Western U.S. Power System is affected by the relative weakness of the electric transmission system connecting the Pacific Northwest and southern California. A 30 MJ (8.4 kWh) superconnecting magnetic energy storage unit with a 10 MW converter to provide system damping for low frequency oscillations is being installed to provide system damping for low frequency oscillations. The seismic mounting of the 30 MJ coil to the dewar lid is complete. Computer operation of the heat rejection trailer, high pressure gas recovery trailer, and converter is accomplished. The converter was operated with an inductive load with energy discharge through the protective dump circuit. Partial computer operation of the refrigerator was performed. The nonconducting dewar was built and tested. A.R.H.

N83-28615# California Univ., Livermore. Lawrence Livermore Lab.

FLYWHEEL ROTOR AND CONTAINMENT TECHNOLOGY DEVELOPMENT FOR FY 1982

Satish V. Kulkarni *In* Courtesy Assoc., Inc. Proc. of the DOE Phys. and Chem. Storage Ann. Contractors' Rev. Meeting Dec. 1982 p 206-219 (For primary document see N83-28586 17-44) (Contract W-7405-eng-48)

Avail: NTIS HC A25/MF A01

The status of technology development for an efficient, economical, and practical composite flywheel having an eneregy density of 88 Wh/kg (20 to 25 E Wh/lb) and an energy storge capacity of approximately 1 kWh is reported. Progress is also reported in the development of a fail-safe, lightweight, and low cost ccmposite containment for the flywheel. One containment design was selected for prototype fabrication and testing. Flywheel rotor cyclic test capability was also demonstrated and evaluated. High strength Kevlar and graphite fibers are being studied. Tests of the elastomeric bond between the rotor and hub indicate that the bond strength exceeds the minimum torque requirements for automobile applications. A.R.H.

N83-28616# Oak Ridge National Lab., Tenn.
FLYWHEEL TESTING AND EVALUATION
R. S. Steele *In* Courtesy Assoc., Inc. Proc. of the DOE Phys. and Chem. Storage Ann. Contractors' Rev. Meeting Dec. 1982 p 220-229 refs (For primary document see N83-28586 17-44)
(Contract W-7405-eng-26)
Avail: NTIS HC A25/MF A01

Results of spin tests support early predictions of flywheel performance, but real world factors require further investigation. Data are presented to support the following general statements: (1) composite flywheel performance is superior to that of metallic flywheels, while (2) presenting less severe containment requirements; (3) composite flywheel fatigue life exceeds 1000 cycles; (4) thermal considerations dictate a low pressure environment; (5) balance characteristics of composite flywheels require special suspension systems provisions; and (6) analytical models predict performance with increasing confidence and are thus becoming more useful in establishing the reliability of the rotor. Testing efforts must now address questions relating to lifetime, reliability, system design, and cost. A.R.H.

N83-28617# Battelle Columbus Labs., Ohio.
MANUFACTURING COST/DESIGN TRADE-STUDIES FOR FLYWHEEL
Bryan R. Noton *In* Courtesy Assoc., Inc. Proc. of the DOE Phys. and Chem. Storage Ann. Contractors' Rev. Meeting Dec. 1982 p 230-239 ref (For primary document see N83-28586 17-44)
Avail: NTIS HC A25/MF A01

A procedure is described for enabling comparison of different flywheel designs based on both performance ratings, and manufacturing and inspection cost. Development of the methodology requires identification of all the steps in the manufacture and inspection of each design, the cost drivers, and the ground rules. A man-hour summary must also be provided. The approach to determine the recurring and nonrecurring manufacturing man-hours is presented. Cost drivers in composite manufacture are discussed as well as the approach to address cost driver data from industry. Some indications for cost driver data from industry. Some indications for cost reduction are included. A.R.H.

N83-28618# Oak Ridge National Lab., Tenn. Metals and Ceramics Div.
NONDESTRUCTIVE TECHNIQUES FOR FATIGUE DAMAGE DETECTION **c38**
W. A. Simpson, Jr. and R. W. McClung *In* Courtesy Assoc., Inc. Proc. of the DOE Phys. and Chem. Storage Ann. Contractors' Rev. Meeting Dec. 1982 p 240-249 (For primary document see N83-28586 17-44)
(Contract W-7405-eng-26)
Avail: NTIS HC A25/MF A01

The ultrasonic properties of an S-2 glass-epoxy composite are being studied in an attempt to determine whether changes in these properties might serve as predictors of incipient failure and/or the extent of fatigue damage. The variables under consideration are the longitudinal and transverse wave velocities, the attenuation, and the backscattering characteristics. A material transfer function giving the attenuation as a continuous function of frequency is also obtained and monitored. These properties are being studied as a function of strain history on tensile specimens and on actual spin-tested flywheels. Author

N83-28619# California Univ., Livermore. Lawrence Livermore Lab.
FIBER COMPOSITE MATERIALS TECHNOLOGY FOR FLYWHEEL ENERGY STORAGE **c24**
T. T. Chiao and R. L. Moore *In* Courtesy Assoc., Inc. Proc. of the DOE Phys. and Chem. Storage Ann. Contractors' Rev. Meeting Dec. 1982 p 250-254 (For primary document see N83-28586 17-44)
Avail: NTIS HC A25/MF A01

Of four fibers developed, two show promise for flywheel applications. One is an improved organic which is not yet commercially available; the other is a graphite tow which is in pilot production. Preliminary strength properties are summarized for 1140 denier strands of the organic and 6K filament tow of graphite impregnated with an epoxy. Design data are given for an S-2 glass-epoxy composite and the longitudinal tension properties of this composite are shown in a table. A.R.H.

N83-28620# General Electric Co., Philadelphia, Pa. Space Systems Div.
COMPOSITE HYBRID FLYWHEEL ROTOR DESIGN OPTIMIZATION AND FABRICATION **c24**
Anthony P. Coppa *In* Courtesy Assoc., Inc. Proc. of the DOE Phys. and Chem. Storage Ann. Contractors' Rev. Meeting Dec. 1982 p 255-262 refs (For primary document see N83-28586 17-44)
Avail: NTIS HC A25/MF A01

Further development of the composite hybrid flywheel rotor is reported. A prototype design having an operational energy capacity of 0.25 kWh and a projected lifetime of 105 acceleration/deceleration cycles was developed. Rotors based on this design were fabricated and delivered for spin test evaluation at designated flywheel test centers. Author

N83-28621# Aerospace Corp., El Segundo, Calif.
ASSESSMENT OF FLYWHEEL SYSTEM BENEFITS IN SELECTED VEHICLE APPLICATIONS
Lester Forrest *In* Courtesy Assoc., Inc. Proc. of the DOE Phys. and Chem. Storage Ann. Contractors' Rev. Meeting Dec. 1982 p 263-269 (For primary document see N83-28586 17-44)
Avail: NTIS HC A25/MF A01

Flywheel-equipped vehicles were compared with their non-flywheel counterparts (baseline systems) on the basis of energy utilization. To accomplish this, a computer-based vehicle simulation program was developed. This program determines the propulsion power required to negotiate each element of the driving cycle, and apportions this power between prime mover and storage device according to one or more selected operating strategies. The state of flywheel (and/or battery) charge is continuously tracked, along with the consumption of fuel or dissipation of battery energy. Energy flows associated with all major component processes are accounted for. Results are given for a four-passenger commuter vehicle with electric drive (range extension application of the flywheel system) and a six-passenger family car with conventional heat engine drive (fuel conservation application of the flywheel system). The six-passenger vehicle was also examined with respect to its use in urban taxi service. A.R.H.

N83-28622# Union Carbide Corp., Oak Ridge, Tenn. Nuclear Div.
ROTOR TESTING IN FY 1982 **c39**
E. F. Babelay, Jr. *In* Courtesy Assoc., Inc. Proc. of the DOE Phys. and Chem. Storage Ann. Contractors' Rev. Meeting Dec. 1982 p 270-278 refs (For primary document see N83-28586 17-44)
(Contract W-7405-eng-26)
Avail: NTIS HC A25/MF A01

The results and observations are reported from flywheel spin tests conducted for the Mechanical Energy Storage Program at the Oak Ridge National Laboratory. Test results include the

completed cyclic fatigue test of a flywheel, as well as ultimate speed evaluations for a modified rotor and three low cost flywheels. A.R.H.

N83-28623# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.
ADVANCED, HIGH-TEMPERATURE MOLTEN SALT STORAGE
Robert J. Copeland *In* Courtesy Assoc., Inc. Proc. of the DOE Phys. and Chem. Storage Ann. Contractors' Rev. Meeting Dec. 1982 p 300-305 refs (For primary document see N83-28586 17-44)
Avail: NTIS HC A25/MF A01

Advanced molten salts (hydroxides, carbonates, and chlorides) are being researched for solar thermal applications. These salts may be used in both the receiver working fluid and in thermal energy storage. Potential applications include electric power production, fuel and chemical production, and high temperature process heat. Molten salts can store sensible heat at temperatures up to 1100 C in a thermocline system with a unique insulating platform (raft) that floats between the hot and cold molten salts. Overall solar thermal and thermal storage systems are described, and the economic potential of the systems are assessed. The performance of insulating raft thermocline are being tested and materials compatibility are studied. S.L.

N83-28624# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.
DIRECT-CONTACT THERMAL STORAGE RESEARCH
John D. Wright and Mark S. Bohn *In* Courtesy Assoc., Inc. Proc. of the DOE Phys. and Chem. Storage Ann. Contractors' Rev. Meeting Dec. 1982 p 312-318 refs (For primary document see N83-28586 17-44)
Avail: NTIS HC A25/MF A01

Direct contact thermal storage research is studied in order to reduce the heat transfer related costs of thermal energy storage systems by performing research on direct contact heat transfer. Research is presently focused on direct contact between air and molten nitrate salts. These devices have cost advantages over conventional fin tube indirect heat exchangers and would be used to couple short term molten salt storage to longer term air/rock storage to obtain long duration storage. These devices would also be used in very high temperature systems that employ molten carbonates or sodium hydroxide. An experimental loop is being constructed to develop and to test methods for predicting the performance of such devices, and to test packing designs. Work using direct contact heat exchange on low temperature latent heat storage in salt hydrates was concluded. Heat transfer was adequate, but some practical operation problems remained. S.L.

N83-28625# Sandia Labs., Livermore, Calif.
SOLAR THERMAL STORAGE APPLICATIONS PROGRAM
William C. Peila *In* Courtesy Assoc., Inc. Proc. of the DOE Phys. and Chem. Storage Ann. Contractors' Rev. Meeting Dec. 1982 p 341-345 (For primary document see N83-28586 17-44)
Avail: NTIS HC A25/MF A01

The efforts of the Storage Applications Program are reviewed. The program concentrated on the investigation of storage media and evaluation of storage methods. Extensive effort was given to experimental and analytical investigations of nitrate salts. Two tasks are the preliminary design of a 1200 MW/sub th/ system and the design, construction, operation, and evaluation of a subsystem research experiment, which utilized the same design. Some preliminary conclusions drawn from the subsystem research experiment are given. DOE

N83-28626# Sandia Labs., Albuquerque, N. Mex.
SUMMARY REPORT OF THE STUDY OF SINGLE MEDIUM THERMOCLINE THERMAL ENERGY STORAGE
Robert J. Gross *In* Courtesy Assoc., Inc. Proc. of the DOE Phys. and Chem. Storage Ann. Contractors' Rev. Meeting Dec. 1982 p 346-360 refs (For primary document see N83-28586 17-44)
Avail: NTIS HC A25/MF A01

Experiments conducted on the 4.54 cu m (1200 gal) engineering prototype thermocline tank are described. Heat loss tested showed that the maximum heat loss could be limited to 4.8% a day. An effective flow diffuser is presented in conjunction with an accurate method for predicting its pressure drop. Charge and discharge tests yielded sharp thermoclines over a broad flow rate range. The one dimensional measured temperature distributions led to a one dimensional predictive model which agreed well with static (no flow) thermocline degradation tests. S.L.

N83-28627# Washington Univ., Seattle. Dept. of Ceramic Engineering.
UNFIRED OLIVINE BRICKS FOR TES
O. J. Whittemore *In* Courtesy Assoc., Inc. Proc. of the DOE Phys. and Chem. Storage Ann. Contractors' Rev. Meeting Dec. 1982 p 384-388 refs (For primary document see N83-28586 17-44)
(Contract W-7405-eng-26)
Avail: NTIS HC A25/MF A01

Olivine is particularly useful for TES because of its low cost, high heat storage capacity, no crystallographic inversions, and refractoriness. Olivine TES brick are being produced by adding small amounts of clay, compacting into bricks and firing at 1200 C or higher. An olivine composition which could be compacted into dense bricks, and simply dried or cured at low temperatures to obviate the expensive firing process was developed. S.L.

N83-28628# Argonne National Lab., Ill.
STRATIFIED STORAGE MEASUREMENT AND ANALYSIS
Roger L. Cole *In* Courtesy Assoc., Inc. Proc. of the DOE Phys. and Chem. Storage Ann. Contractors' Rev. Meeting Dec. 1982 p 405-409 refs (For primary document see N83-28586 17-44)
Avail: NTIS HC A25/MF A01

Water tanks operated at low temperatures (0 to 15 C) are more difficult to stratify because water's coefficient of thermal expansion beta is small in that temperature range and it changes sign at 4 C. Research has shown that stratification can improve the performance of solar systems by as much as 20%. It is shown that the Richardson number is the most important parameter governing thermal stratification. For Richardson numbers less than the critical value of 0.25 mixing occurs, but for Richardson number greater than 0.25 stratification is possible. S.L.

N83-28629# Lockheed Missiles and Space Co., Huntsville, Ala.
HEAT STORAGE BUILDING MATERIALS FOR PASSIVE SOLAR APPLICATIONS
James W. Fletcher and P. G. Grodzka *In* Courtesy Assoc., Inc. Proc. of the DOE Phys. and Chem. Storage Ann. Contractors' Rev. Meeting Dec. 1982 p 410-414 refs (For primary document see N83-28586 17-44)
Avail: NTIS HC A25/MF A01

The technical concerns and cost aspects of developing heat storage wall/ceiling panels for use in passive solar heated structures are addressed. The phase change materials (PCM) wall and ceiling panels were developed and tested for applications where the charge mechanisms are free and forced air convection and direct irradiation of the panel in the Sun. The discharge mechanism will involve both convection and radiation heat transfer to the room from the PCM wall and ceiling panels. Structured in this way, this panel development program is responsive to the needs of structures which utilize attic air collectors and interior storage as well as direct gain structures. S.L.

N83-28630# Institute of Gas Technology, Chicago, Ill.
DEVELOPMENT OF COMPOSITE TES MEDIA FOR HIGH-TEMPERATURE STORAGE APPLICATIONS
Terry D. Claar, R. J. Petri, and E. T. Ong *In* Courtesy Assoc., Inc. Proc. of the DOE Phys. and Chem. Storage Ann. Contractors' Rev. Meeting Dec. 1982 p 426-432 refs (For primary document see N83-28586 17-44)
Avail: NTIS HC A25/MF A01

A thermal energy storage (TES) media concept utilizing carbonate salts retained within the microporous structure of a

ceramic matrix is being developed for such high temperature storage applications as industrial waste heat recovery/storage and solar thermal power systems. The composite carbonate salt/ceramic media can operate in direct contact with compatible working fluids, a feature which offers significant potential for cost reduction and improved heat exchange performance over previous shell and tube molten salt TES designs. Results of the generic composite media development efforts, materials stability testing, and TES performance evaluations are discussed. S.L.

N83-28631# Rocket Research Corp., Redmond, Wash.
APPLICATION OF THERMAL ENERGY STORAGE TO PROCESS HEAT RECOVERY. PHASE 3: HEAT EXCHANGER TESTING IN DIRTY GAS ENVIRONMENT
L. B. Katter and David J. Shaw *In* Courtesy Assoc., Inc. Proc. of the DOE Phys. and Chem. Storage Ann. Contractors' Rev. Meeting Dec. 1982 p 433-440 (For primary document see N83-28586 17-44)
Avail: NTIS HC A25/MF A01

The use of thermal energy storage to improve the utilization of reject process heat as a source of energy for a district heating system is investigated. The specific energy source being studied is the aluminum reduction process. Energy supply in an aluminum plant is continuous and constant 24 hours/day, 365 days/year. The energy demand in a district heating system is highly variable with diurnal, weekly and annual cycles. Thermal energy storage improves the cost effectiveness of investments in energy recovery and distribution equipment and decreases the need for supplemental fuel for the district heating system. S.L.

N83-28632# Union Carbide Corp., Oak Ridge, Tenn. Nuclear Div.
MATHEMATICAL MODELING OF TES SUBSYSTEMS
A. D. Solomon, C. A. Serbin, and John J. Tomlinson *In* Courtesy Assoc., Inc. Proc. of the DOE Phys. and Chem. Storage Ann. Contractors' Rev. Meeting Dec. 1982 p 459-464 refs (For primary document see N83-28586 17-44)
Avail: NTIS HC A25/MF A01

It is believed that the use of phase change materials (PCMs) levels the load and improves the comfort. This is because large amounts of heat can (in principle) be stored in the PCMs at its phase change temperature. The options available to when PCM is put into the building structure are investigated using analytical and numerical studies. The optimal approaches to doing this are identified. Among other questions, looked at are the efficacy of locating the PCM at the wall surface as opposed to internal storage, the necessity of exposing the PCM directly to beam radiation, and the optimal choice of the PCM. Many of the projections and recommendations spring from a one room computer simulation of solar flux room thermal processes. S.L.

N83-28633# Kalamazoo Coll., Mich. Dept. of Chemistry.
MEASURING THERMAL GRADIENTS IN A MELTING/FREEZING PCM WITH A LASER **c36**
Ralph M. Deal and Rene Papo *In* Courtesy Assoc., Inc. Proc. of the DOE Phys. and Chem. Storage Ann. Contractors' Rev. Meeting Dec. 1982 p 465-469 refs (For primary document see N83-28586 17-44)
Avail: NTIS HC A25/MF A01

A water loop was constructed and used to control the temperature on one face of a 64 cu. in. cell containing PCM. Two faces were equipped with plate glass windows allowing a laser beam to pass through the cell and its net deflection to be measured. Thermal gradients in the liquid phase were compared with computer simulation of conduction in a PCM. Preliminary measurements with the current cell design show significant contributions to heat transfer in the PCM from convection despite attempts to limit heat transfer to conduction. Author

N83-28634# Oak Ridge National Lab., Tenn. Chemistry Div.
THERMODYNAMIC PROPERTIES AND INTERACTIONS OF SALT HYDRATES USED AS PHASE CHANGE MATERIALS
J. Braunstein *In* Courtesy Assoc., Inc. Proc. of the DOE Phys. and Chem. Storage Ann. Contractors' Rev. Meeting Dec. 1982 p 470-474 refs (For primary document see N83-28586 17-44)
(Contract W-7405-eng-26)
Avail: NTIS HC A25/MF A01

The state-of-the-art of salt hydrates as phase change materials for low temperature thermal energy storage is reviewed with the objective of recommending research that would result in more practicable use of these materials. Areas for review included phase equilibria, nucleation behavior and melting kinetics of the commonly used hydrates. S.L.

N83-28635# Stanford Univ., Calif. Dept. of Mechanical Engineering.
DEVELOPMENT OF A PREDICTIVE COMPUTER CODE FOR HEAT LOSSES FROM SOLAR EXTERNAL RECEIVERS
Baharam Afshari and Joel H. Ferziger Feb. 1983 48 p refs
(Contract DE-AC04-76DP-00789)
(DE83-007310; SAND-82-8183) Avail: NTIS HC A03/MF A01

Mixed convection from external receivers is considered. the governing partial differential equations are stated, and the numerical solution is obtained by Keller's box method. The computer code developed to predict the heat losses in the attached flow region is described. Special attention is given to treatment of some numerical difficulties. Preliminary computational results for laminar three dimensional mixed convection are presented. Future project efforts and planned extensions of the present code are described. DOE

N83-28636# California Univ., Livermore. Lawrence Livermore Lab.
SOLAR-THERMAL DECOMPOSITION OF ZINC SULFATE
Pamela K. Shell, Roberto Ruiz, and Conrad M. Yu Jan. 1983 35 p refs
(Contract W-7405-eng-48)
(DE83-007461; UCRL-53370) Avail: NTIS HC A03/MF A01

Experimental decomposition of zinc sulfate in a rotary kiln which was heated in the White Sands Solar Furnace is described. The main findings are: the zinc sulfate sulfate decomposed after 1 to 5 minutes of solar exposure when the front thermocouple indicated 7000 C and kiln was being rapidly heated with a flux of 9 to 14 kW; or the front thermocouple was above 8500 C and the kiln was maintained at temperature with a minimal flux. It is found that there is a problem with zinc sulfate agglomeration above approximately 8000 C. The agglomeration problem interfered significantly with testing, and it prevented the acquisition of quantitative data on the rate and extent of zinc sulfate decomposition. The agglomeration problem solved either by physically breaking apart the agglomerate by chains or by mixing inert compounds with the zinc sulfate to prevent the particles from sticking to each other. The rotary kiln performed satisfactorily and there were no problems with the window. DOE

N83-28637# Arizona Univ., Tucson. Lab. for Environmental Research.
WINDOWS FOR ACCEPTING OR REJECTING SOLAR-HEAT GAIN Final Report
John F. Peck, T. Lewis Thompson, and Helen J. Kessler Sep. 1982 39 p refs
(Contract DE-AC03-76SF-00098)
(DE83-007584; LBL-15440) Avail: NTIS HC A04/MF A01

Ordinary fenestration may be modified at low cost using various combinations of windows, duotone venetian blinds, and drapes to control the solar heat gain. In the winter, solar radiation may be absorbed by dark blinds and transferred to the air, minimizing fading of furnishings while collecting useful energy. In the summer, more than 90% of the total potential window heat gain may be rejected by exhausting evaporatively cooled air over the blinds. The performance of several window configurations was analyzed, modeled on a computer, and verified experimentally. DOE

N83-28638# Little (Arthur D.), Inc., Cambridge, Mass.
WIND-TURBINE PERFORMANCE ASSESSMENT

W. A. Vachon Jan. 1983 128 p refs
(EPRI Proj. 1996-1)
(DE83-901449; EPRI-AP-2796; TSR-5) Avail: NTIS HC A07/MF A01

Test data and experiences from funded wind turbine (WT) development and test programs in the United States and Europe are summarized. Summaries of test results for the US Department of Energy (DOE) cluster of three COD-2 2.5-MW/WT's, four MOD-OA 0.2-MW WT's, and three 0.1-MW vertical-axis WT's are presented. Descriptions of the DOE's two MOD-5 WT's, with power ratings of 7.3 and 7.2 MW, are also provided. The US Department of the Interior's Bureau of Reclamation program is updated with status reports on the 4-MW and 2.5-MW system verification units and recent test results from privately funded programs are summarized. A summary of key foreign WT programs, including test results from ongoing Danish machine tests are discussed. DOE

N83-28639# McDonnell-Douglas Astronautics Co., Huntington Beach, Calif.
THE 10 MWe SOLAR THERMAL CENTRAL RECEIVER PILOT PLANT: SOLAR FACILITIES DESIGN INTEGRATION. PILOT-PLANT STATION MANUAL (RADL ITEM 2-1). VOLUME 1: SYSTEM DESCRIPTION
Sep. 1982 629 p
(Contract DE-AC03-79SF-10499)
(DE83-001667; MDC-G-8544-VOL-1; SAN-0499-57-VOL-1) Avail: NTIS HC A99/MF A01

The complete Barstow Solar Pilot Plant is described. The plant requirements and general description are presented, the mechanical, electric power, and control and instrumentation systems as well as civil engineering and structural aspects and the station buildings are described. Included in the mechanical systems are the heliostats, receiver, thermal storage system, beam characterization system, steam, water, nitrogen, and compressed air systems, chemical feed system, fire protection system, drains, sumps and the waste disposal systems, and heating, ventilating, and air conditioning systems. DOE

N83-28640# Tennessee Valley Authority, Chattanooga. Div. of Energy Conservation and Rates.
NASHVILLE SOLAR-WATER-HEATER DEMONSTRATION PROJECT. MONITORING-DATA ANALYSIS Interim Report, Sep. - Nov. 1981
Mar. 1982 60 p refs
(DE83-900173; TVA/OP/ECR-82/39(9-11)) Avail: NTIS HC A04/MF A01

Field monitoring data which were collected for the Nashville Solar Water Heater Demonstration Project from September through November of 1981 are presented. Twenty-six solar domestic water heaters were monitored during September, 35 during October, and 37 during November. Homeowners were audited to assure adequate solar access, and each selected a solar water heating system from an approved list. Two tank and one tank systems are included. The monitoring sample technique and monitoring system are described. Data are analyzed by computer to produce daily and monthly total summaries for each site. The performance of each site was assessed to compare total energy saved by the solar system, solar system savings percentage, and the energy multiplier. DOE

N83-28641# American Society of Mechanical Engineers, New York.
SMALL WIND POWER IN THE SOUTHWESTERN UNITED STATES
George P. Tennyson 1983 13 p Presented at the Energy Sources Technol. Conf. and Exhibition, Houston, Tex., 30 Jan. - 3 Feb. 1983
(Contract DE-AC04-76DP-00789)
(DE83-005936; CONF-830108-2) Avail: NTIS HC A02/MF A01

The Southwestern Great Plains agricultural production in both vegetable crops and cattle, and the extraction industries in oil and natural gas recovery both feed and power a significant percentage of our nation. Energy costs that are rising faster than the rate of return on the sale of these products are contributing to a serious situation with many farms being abandoned and oil wells being capped. Wind energy, which is abundant in the region, is investigated as a near term applicable alternative energy sources. DOE

N83-28642# Waste Management, Inc., Oak Brook, Ill.
ASEF SOLID-WASTE-TO-METHANE GAS, POMPANO BEACH, FLORIDA, refCOM Technical Status Report, Oct. 1982 - 12 Jan. 1983
H. Peter Mooij Jan. 1983 47 p
(Contract DE-AC02-76CS-20038)
(DE83-006817; DOE/CS-20038/T8) Avail: NTIS HC A03/MF A01

Five graphs are presented to document solid waste to methane experiments. The first simply shows the number of hours spent running in relation to the number of tons of material fed into the digester. The second shows the relationship between tonnage fed and subsequent gas production. Tonnage is further broken down into moisture, dry, and volatile fractions. The third graph shows the relationship between methane and carbon dioxide in the off gas. The fourth graph shows the pH, alkalinity, and volatile acids in the digester slurry environment, Nutrient levels of the effluent are shown in the fifth graph. Finally, materials analysis and gas production data are tabulated. DOE

N83-28643# Solar Energy Industries Association, Washington, D.C.
SOLAR-THERMAL-PROGRAM STRATEGY
Jan. 1983 36 p
(Contract DE-AC04-82AL-19929)
(DE83-006997; DOE/AL-19929/T1) Avail: NTIS HC A03/MF A01

The status of the solar thermal industry, including companies developing parabolic dish, parabolic trough, and central receiver systems was reviewed and the industry's strategy is assessed. Strategic targets are in the utility and industrial sectors. The approaches of the Carter and Reagan Administrations are compared. A case is made against cutting off funding at the present time. DOE

N83-28644# Boeing Computer Services, Inc., Seattle, Wash.
INTERMEDIATE PHOTOVOLTAIC SYSTEM APPLICATION EXPERIMENT OPERATIONAL PERFORMANCE REPORT. VOLUME 7: FOR OKLAHOMA CENTER FOR SCIENCE AND ARTS, OKLAHOMA CITY, OKLAHOMA FOR NOVEMBER 1982
Jan. 1983 25 p Prepared for Sandia Labs., Albuquerque, N. Mex.
(Contract DE-AC04-76DP-00789)
(DE83-007093; SAND-81-7087/7) Avail: NTIS HC A02/MF A01

The data accumulated during November 1982 at the intermediate photovoltaic project at Oklahoma Center for Science and Arts are presented. Generated energy and environmental (weather) data are presented graphically and explanations of irregularities not attributable to weather are provided. DOE

N83-28645# Illinois Inst. of Tech., Chicago. Dept. of Mechanical Engineering.
THERMAL-ECONOMIC ANALYSIS OF ORGANIC RANKINE COMBINED CYCLE COGENERATION
Robert W. Porter Dec. 1982 99 p refs
(Contract DE-FG02-80CS-40337)
(DE83-007143; DOE/CS-40337/13; IIT-TR-82-3) Avail: NTIS HC A05/MF A01

An evaluation of organic rankine cycles (ORC) as combined with topping incorporating gas turbines or diesel engines, and with subsequent waste heat utilization is presented. It is found that the potential benefit of the proposed organic Rankine combined cycle cogeneration of useful heat and electricity is more flexible in meeting demands for the two products, by varying the mode of operation of the system. A thermal-economic analysis is developed and illustrated with cost and performance data for commercially

available equipment, and with general economic parameters reflecting current regulations and market conditions. The performance of the ORC and of the entire combined cycle is described. Equations to evaluate the various thermodynamic and economic parameter, and the resultant case flows are presented. Criteria are developed to assess the addition of an ORC to a cogeneration system without ORC is viable based on rate of return on incremental investment. It is indicated that the proposed system is potentially viable, however, it is not viable under conditions prevailing in Chicago for the selected case studies. DOE

N83-28646# Energy Utilization Systems, Inc., Monroeville, Pa.
EXAMINATION AND LIFE ASSESSMENT OF FIELD-TESTED HEAT-PUMP WATER HEATERS
William P. Bernardi, Robert P. Blevins, and Barry D. Sloane Dec. 1982 77 p refs
(Contract W-7405-eng-26)
(DE83-007177; ORNL/SUB-7321/5) Avail: NTIS HC A05/MF A01

An electric heat pump water heater (HPWH) was developed for domestic use. This device is interchangeable with conventional electric or oil fired water heaters but significantly reduces energy consumption by using air conditioning technology, the HPWH removes heat from the surrounding air and rejects the heat to its integral water tank. Design, development, and an 85 unit field of the HPWH are demonstrated. The results of destructive examination of 20 units which had operated for 2 years are presented. Life expectancy and the need for redesign are evaluated. DOE

N83-28647# North Wind Power Co., Warren, Vt.
NORTH WIND 2-kW HIGH-RELIABILITY WIND SYSTEM. PHASE 2: FABRICATION AND TEST
Donald J. Mayer and John H. Norton, Jr. Jun. 1982 43 p
(Contract DE-AC04-76DP-03533)
(DE83-007196; RFP-3426) Avail: NTIS HC A03/MF A01

The fabrication and testing of three production prototypes of a 2 kW high reliability wind energy conversion system intended for use in remote locations and harsh environments are described. Design and analysis activities which continued into Phase 2 are presented. Prototype No. 1 was tested for 1.5 months prior to shipment to Rocky Flats. Testing at Rocky Flats continued until a bent shaft was discovered, at which time unit No. 1 was replaced with prototype No. 2. Testing of No. 2 is ongoing at Rocky Flats and results will be published at a later date. Since the start of Unit No. 2 testing, a third prototype was installed at North Wind for parallel testing. Upon completion of the in house test program, this unit will be shipped to Rocky Flats. A contractor organizational chart and Phase 2 schedule are shown. DOE

N83-28648# California Univ., Berkeley. Lawrence Berkeley Lab. Energy and Environment Div.
SOLAR ENERGY PROGRAM, FY 1981 Annual Report
Sep. 1982 34 p refs
(Contract DE-AC03-76SF-00098)
(DE83-006955; LBL-13496) Avail: NTIS HC A03/MF A01

Passive research and development, active solar cooling, appropriate energy technology, energy conversion by the retinal protein. Bacteriohodopsin, measurement and analysis of circumsolar radiation, support for SOLERAS solar cooling engineering field tests, LBL building 71 solar cooling project, development of a 30-kW high temperature solar receiver using small particles as the heat exchanger, and diffractive solar collection systems. For individual titles, see N83-28649 through N83-28655.

N83-28649# California Univ., Berkeley. Lawrence Berkeley Lab.
PASSIVE RESEARCH AND DEVELOPMENT
R. C. Kammerud, J. W. Place, M. R. Martin, P. H. Berdahl, D. Elmer, B. Andersson, F. S. Bauman, W. L. Carroll, A. J. Gadgil, A. Mertol et al *In its* Solar Energy Program, FY 1981 Sep. 1982 7 p refs (For primary document see N83-28648 17-44)
Avail: NTIS HC A03/MF A01

Convection research, radiative cooling, building energy analysis, and domestic hot water, research activities are reported. Author

N83-28650# California Univ., Berkeley. Lawrence Berkeley Lab.
ACTIVE SOLAR COOLING
M. A. Wahlig, K. Dao, M. L. Warren, J. E. Rasson, R. A. Armer, H. Angerman (Keller and Gannon), and A. Heitz (Keller and Gannon) *In its* Solar Energy Program, FY 1981 Sep. 1982 9 p refs (For primary document see N83-28648 17-44)
Avail: NTIS HC A03/MF A01

The single-effect chiller was tested and evaluated. Cost goal methodology, system and subsystem costs, and controls test facility and analysis are presented. Technical support activities are also reported. Author

N83-28651# California Univ., Berkeley. Lawrence Berkeley Lab.
ENERGY CONVERSION BY THE RETINAL PROTEIN, BACTERIORHODOPSIN
L. Packer, A. T. Quintanilha, R. J. Mehlhorn, I. Fry, J. Herz, E. La, and S. Tristam-Nagle *In its* Solar Energy Program, FY 1981 Sep. 1982 5 p refs (For primary document see N83-28648 17-44)
Avail: NTIS HC A03/MF A01

Chemical modification studies, low temperature studies, effects of non-ionic detergents, and white membrane studies are reported. Author

N83-28652# California Univ., Berkeley. Lawrence Berkeley Lab.
SUPPORT FOR SOLERAS SOLAR COOLING ENGINEERING FIELD TESTS
M. A. Wahlig and F. H. Salter *In its* Solar Energy Program, FY 1981 Sep. 1982 2 p Sponsored in part by the Solar Energy Research Inst. and the United States-Saudi Arabian Joint Commission on Economic Cooperation (For primary document see N83-28648 17-44)
Avail: NTIS HC A03/MF A01

Critical design reviews, final construction plans, equipment inspection, construction progress, and SOLERAS-DOE design review are discussed. Author

N83-28653# California Univ., Berkeley. Lawrence Berkeley Lab.
LBL BUILDING 71 SOLAR COOLING PROJECT
F. H. Salter *In its* Solar Energy Program, FY 1981 Sep. 1982 1 p (For primary document see N83-28648 17-44)
Avail: NTIS HC A03/MF A01

The purposes of this program are to demonstrate the Federal Government's confidence in the solar industry and to stimulate growth and technical improvements is solar technology through the installation and demonstration of a variety of commercially applicable solar energy systems in buildings owned or occupied by the Federal Government. Author

N83-28654# California Univ., Berkeley. Lawrence Berkeley Lab.
DEVELOPMENT OF A 30-kW HIGH TEMPERATURE SOLAR RECEIVER USING SMALL PARTICLES AS THE HEAT EXCHANGER
A. J. Hunt, M. Deiringer, D. B. Evans, L. Hansen, P. G. Hull, and D. Paydarfar *In its* Solar Energy Program, FY 1981 Sep. 1982 3 p refs (For primary document see N83-28648 17-44)
Avail: NTIS HC A03/MF A01

The purpose of this work is to develop a new type of solar thermal receiver that utilizes concentrated sunlight to heat a gas to high temperature to operate a turboelectric generator or to supply industrial process heat. The Small Particle Heat Exchange Receiver (SPHER) uses a very small mass of ultrafine carbon particles suspended in a gas to absorb sunlight and transfer the heat to the gas. The concentrated sunlight, provided by a parabolic dish or system of mirrors, passes through a window into a chamber containing the absorbing suspension. Because the energies are very small, they are not significantly affected by gravitational or inertial forces; they are effectively part of the gas. Author

N83-28655# California Univ., Berkeley. Lawrence Berkeley Lab.
DIFFRACTIVE SOLAR COLLECTION SYSTEMS
D. B. Evans and A. J. Hunt *In its* Solar Energy Program, FY 1981 Sep. 1982 3 p refs (For primary document see N83-28648 17-44)

Avail: NTIS HC A03/MF A01

The purpose of this project is to investigate solar collector systems based on the diffraction of light. Present solar collection systems rely on reflection or refraction of sunlight. The technique proposed here is based on the use of diffractive optics, in particular Holographic Optical Elements (HCE's), to intercept sunlight and diffract it toward an energy conversion or storage device (e.g., photovoltaic cell, solar thermal receiver, or thermal mass). Author

N83-28656# University of North Alabama, Florence. Dept. of Chemistry.

CONVERSION OF WASTE CELLULOSE TO ETHANOL. PHASE 2: REACTION KINETICS WITH PHOSPHORIC ACID

Michael B. Moeller and Raymond E. Isbell May 1982 36 p refs (DE82-906111; TVA/OP/EDT-82/42) Avail: NTIS HC A03/MF A01

Waste cellulosic material can be hydrolyzed in dilute acid solution to produce fermentable sugars which can then be converted into ethanol. A laboratory investigation was made of the feasibility of using phosphoric acid as the hydrolysis catalyst. The hydrolysis reaction with phosphoric acid solutions was compared with the reaction employing the more conventional dilute sulfuric acid catalyst. The purpose of this research was to examine the hydrolysis step in a proposed process for the conversion of cellulose (from wood, newspapers, municipal solid waste, or other sources) into ethanol - by which a potentially valuable co-product, DICAL (dicalcium phosphate), might be made and sold with or without the lignin content as a fertilizer. The pertinent reaction kinetics for the acid catalyzed production of glucose from cellulose consists of consecutive, pseudo-first order reactions. DOE

N83-28657# Arizona Univ., Tucson. Dept. of Chemical Engineering.

EVALUATION OF GEOTHERMAL COOLING SYSTEMS FOR ARIZONA

Don H. White and Larry A. Goldstone Aug. 1982 50 p refs Prepared for Arizona Solar Energy Commission, Phoenix
(Contract DE-FC03-80RA-50076)
(DE83-005311; DOE/RA-50076/13) Avail: NTIS HC A03/MF A01

Two geothermal-driven cooling systems namely, absorption cooling and heat pumps, are discussed. Adsorption cooling requires a geothermal resource above 1050C (2200F) in order to operate at a reasonable efficiency and capacity. Geothermal resources at these temperatures or above are believed existing in the Phoenix and Tucson areas, but at such depths that geothermal-driven absorption systems have high capital investments. Such capital investments are uneconomical when paid out over only five months of operation each year, but become economical when cascaded with other geothermal uses. There may be other regions of the state, where geothermal resources exist at 1050C (2200F) or higher at much less depth, such as the Casa Grande/Coolidge or Hyder areas, which might be attractive locations for future plants of the high-technology industries. Geothermal assisted heat pumps are shown to be economical for nearly all areas of Arizona. They are more economical and reliable than air-to-air heat pumps. Such systems in Arizona depend upon a low-temperature geothermal resource in the narrow range of 15.5 to 26.60C (60 to 800F), and are widely available in Arizona. DOE

N83-28658# Los Alamos Scientific Lab., N. Mex.

REACTIONS FOR IMPROVING EFFICIENCIES IN THERMOCHEMICAL CYCLES RELATED TO THE SULFUR DIOXIDE-IODINE PROCESS

C. F. V. Mason and M. G. Bowman 1982 11 p refs Presented at World Hydrogen Energy Conf., Pasadena, Calif., 13 Jun. 1982
(Contract W-7405-eng-36)
(DE82-008176; LA-UR-82-467; CONF-820605-6) Avail: NTIS HC A02/MF A01

A modification of the sulfur dioxide iodine cycle which uses magnesium oxide, magnesium sulfite and magnesium iodide is examined with particular emphasis on decreasing the amount of water employed and thereby increasing the efficiency. The key reaction is that of iodine with magnesium oxide and magnesium sulfite hexahydrate with no additional water. This produces 77% of the total possible sulfate as well as magnesium iodide, hydrogen iodide and hydrogen at 523 K. The efficiency of this cycle varies between 58% and 39% depending on the amount of heat that can be recovered. This is the first example of a cycle where there is no large energy burden due to evaporation. DOE

N83-28659# Los Alamos Scientific Lab., N. Mex.

TWO BISMUTH SULFATE-SULFURIC ACID HYBRID WATER-SPLITTING CYCLES. PROPOSED ANTIMONYL SULFATE CYCLE

W. M. Jones 1982 9 p refs Presented at World Hydrology Energy Conf., Pasadena, Calif., 13 Jun. 1982
(Contract W-7405-eng-36)
(DE82-011976; LA-UR-82-583; CONF-820605-13) Avail: NTIS HC A02/MF A01

Two hybrid thermochemical cycles for the production of hydrogen which involve bismuth trisulfate and/or bismuth oxysulfates were investigated. Equilibrium sulfur trioxide pressure are given graphically for three solid gas equilibria involving Bi2(SO4)3 alpha- and beta-Bi2O(SO4)2, and Bi2O2SO4. An improved method of carrying out the low temperature step for Cycle 1 is presented which may provide a remedy to a problem of sorption of sulfuric acid solution by the solids. An antimonyl sulfate - sulfuric acid hybrid cycle is outlined in which SO2 and O2 are evolved at different temperatures, simplifying the usual SO3-SO2-O2 separation problem. DOE

N83-28660# Los Alamos Scientific Lab., N. Mex.

ECONOMIC PROFILES OF SELECTED SOLAR-ENERGY TECHNOLOGIES FOR USE IN INPUT-OUTPUT ANALYSIS

G. S. Mann and B. F. Neenan May 1982 98 p refs
(Contract W-7405-eng-36)
(DE82-016741; LA-9083-TASE) Avail: NTIS HC A05/MF A01

A methodology for preparing cost profiles of prototype, nonconventional energy technologies for use with economic input/output analysis is presented. The application of the costing methodology is represented where economic profiles are presented for 12 solar energy related technologies. The development of a practical, theoretical framework that yields the most suitable configuration of the technology cost profiles is outlined. Characterization and emerging technology to assess industry related impacts caused by its potential future application by using an input/output model of the economy are discussed. The theoretical problem is of specifying an emerging, but currently nonexistent, industrial sector within an existing economic matrix. It is shown how consistent economic profiles can be built up from the engineering specifying an emerging, but currently nonexistent, industrial sector within an existing economic matrix. It is shown how consistent economic profiles can be built up from the engineering specifications of a prototype energy conversion system. DOE

N83-28661# Los Alamos Scientific Lab., N. Mex. Economics Group.

IMPACT OF SOLAR-ENERGY DEVELOPMENT. THE AGGREGATE IMPACT ON BASIC ECONOMIC OBJECTIVES

A. Parker (New Mexico Univ., Albuquerque), C. Kirschner (New Mexico Univ., Albuquerque), and F. Roach 1982 7 p refs Presented at Am. Section of the Intern. Solar Energy Soc. Conf., Houston, Tex., 1 Jun. 1982
(Contract W-7405-eng-36)
(DE82-012151; LA-UR-82-871; CONF-820629-2) Avail: NTIS HC A02/MF A01

Two categories of incentives for the development of solar energy are described: those that increase the benefits associated with the ownership of a solar energy system and those that reduce the cost of the system. The impact of two alternative programs are presented. Short run and long run impacts expected to result from the installation of passive solar designs on existing housing rock are distinguished. Impacts associated with a program to deregulate natural gas and one combining tax credits and low interest loans are compared. The impacts of solar programs on

seven basic economic goals are analyzed. The goals are full employment, price stability, economic efficienty, equitable distribution of income, economic growth, balancing the federal budget, and a strong national defense. DOE

N83-28662# California Univ., Berkeley. Lawrence Berkeley Lab.
COST AND PERFORMANCE GOAL METHODOLOGY FOR ACTIVE SOLAR-COOLING SYSTEMS
Mashuri L. Warren and Michael Wahlig Feb. 1982 83 p refs
(Contract W-7405-eng-48)
(DE82-009842; LBL-12753) Avail: NTIS HC A05/MF A01

Economic and thermal performance analyses of typical residential and commercial active solar cooling systems are used to determine cost goals for systems to be installed between the years 1986 and 2000. Market studies indicate a relationship between market penetration (percent of market captured) and payback period for heating, ventilating, and air conditioning systems. Using reasonable values for fuel escalation and inflation rates, the payback period is related to the expected real return on investment. Postulating commercial introduction of solar cooling systems in 1986 with the market share increasing to 20% by the year 2000, payback and return on investment goals for cooling systems as a function of year of purchase are established. Using the results of systems analysis of representative 3 ton solar residential cooling/heating systems and 25 ton commercial solar cooling systems for four different cities (Ft. Worth, Phoenix, Miami, and Washington, DC), the return on investment goals are used to calculate the 20 year present value of energy savings of the solar energy systems. DOE

N83-28663# Rockwell International Corp., Golden, Colo. Energy Systems Group.
ADVANCED CONCEPTUAL DESIGN OF THE SOLAR-REPOWERING SYSTEM FOR WEST TEXAS UTILITIES COMPANY, PAINT CREEK POWER STATION UNIT NO. 4 Final Report
7 May 1982 443 p refs
(Contract DE-AC03-81SF-11569)
(DE82-014606; ESG-DOE-13387) Avail: NTIS HC A19/MF A01

The results of the conceptual design study reported include the development of a workable design for a sodium-cooled tower focus repowering system, the costs required to construct that design, and the determination of the benefits which could be obtained. A number of trade studies and optimizations were carried out in order to derive the most cost-effective design that also had the greatest potential for widespread application and commercialization. These studies are identified and their results are presented and discussed. The overall plant design is described and diagrammed, as are each of the subsystems: the heliostats, external receiver, master control, heat transport, thermal storage, electric power generating, and steam generating subsystems. Each subsystem's cost is summarized by major component. The subsystem is then described with its major components in terms of physical characteristics, requirements, and performance. DOE

N83-28664# Trinity Univ., San Antonio, Tex.
TEST-MODULE COOLING EXPERIMENTS AT THE PASSIVE TEST FACILITY FOR WARM, HUMID CLIMATES
P. Haves, M. Merino, J. Mosley, and T. Jankovic May 1982 86 p refs
(Contract DE-AC03-79CS-30201)
(DE82-018414; DOE/CS-30201/T8) Avail: NTIS HC A05/MF A01

Cooling experiments performed with test modules at the Passive Test Facility at Trinity University during 1981 are described. Two modules were used: a four foot square roof pond module, which was operated in parallel with a full size test building, and a four foot by eight foot trickle roof module. Four experiments were performed on the pond module. Dry bag experiments were carried out from July 14 to October 16 in order to compare the heat loss rate of the module to that of the full scale houses. Flooded bag experiments were conducted on October 26 and October 30 through November 6. The bag was flooded with approximately 1 in. of water. Open pond experiments were performed from November 6 through November 9 in order to determine evaporative loss. Parapet experiments were conducted on July 28 to July 30 in order to determine the effect of air speed over the bags. The trickle roof module was used to investigate the heat loss rate from water flowing down a tilted surface. DOE

N83-28665# Neomathics, Inc., Cambridge, Mass.
AN INTEGRATED PLANNING STRUCTURE FOR COMMERCIAL APPLICATIONS OF ACTIVE SOLAR COOLING: METHODOLOGY AND ANALYSIS Final Report
May 1982 133 p refs
(Contract DE-AC03-81CS-30571)
(DE82-016645; DOE/CS-30571/T2) Avail: NTIS HC A07/MF A01

The likely market for solar cooling is evaluated within an integrated planning framework. A major objective is to develop the set of tools that are needed to determine performance and cost targets that will make solar cooling cost-effective in a given time frame. Cooling needs and solar cooling's possible role in fulfilling those needs are reviewed. The commercial market is isolated as the one with the greatest potential for using solar cooling. The theory and application of market modeling in the industrial/commercial sector are reviewed in detail. Adoption and market penetration models are discussed and reviewed and the results of studies of the solar market place are presented. The philosophy followed is that no one knows the future exactly; therefore, the best we can do is develop methodology that can project, under various scenarios, what is most likely to happen. The assumptions that go into that analysis and the development of the appropriate tools are discussed in detail. DOE

N83-28666# Argonne National Lab., Ill.
LITHIUM/IRON SULFIDE BATTERIES FOR ELECTRIC-VEHICLE PROPULSION AND OTHER APPLICATIONS Progress Report, Oct. 1980 - Sep. 1981
Feb. 1982 108 p refs
(Contract W-31-109-eng-38)
(DE82-014372; ANL-81-65) Avail: NTIS HC A06/MF A01

This report covers the research, development, and management activities of the programs involving high-performance lithium aluminum/iron sulfide batteries at Argonne National Laboratory (ANL) and at contractors' laboratories during the period October 1980 through September 1981. These batteries, which are being developed for electric-vehicle propulsion and stationary energy-storage applications, consist of vertically oriented prismatic cells with one or more inner positive electrodes of FeS or FeS2 facing negative electrodes of lithium-aluminum, and molten LiCl-KCl electrolyte. Most of the cell and battery design, development, and fabrication for the program to develop a full-scale electric-vehicle battery was subcontracted to two industrial films Eagle-Picher Industries, Inc. and Gould Inc. The present program stresses the development and testing of high-reliability cells and the fabrication and testing of small (up to 10 cells) modules. A major technical change in the present contractor-developed cells is the use by Gould of MgO powder separators. DOE

N83-28667# Los Alamos Scientific Lab., N. Mex.
ELECTRIC-UTILITY OIL AND GAS USE IN THE EIGHTIES
C. D. Kolstad, D. S. Abbey, A. J. Martinez, D. S. Williams, F. A. Wolak, Jr. (Harvard Univ.), and M. K. Yeamans Apr. 1982 164 p refs
(Contract W-7405-eng-36)
(DE82-015032; LA-9313-MS) Avail: NTIS HC A08/MF A01

This report forecasts possible levels of oil and gas use by electric utilities in the US through 1990. The analysis is done at a regional level. High and low levels of electricity demand as well as nominal and diminished availability of new generating capacity are assumed. Projected oil and gas use for 1990 ranges from 1000 to 3200 barrels per day. DOE

N83-28668# Hawaii Univ., Manoa. Natural Energy Inst.
RENEWABLE ENERGY IN HAWAII Progress Report

Mary Troy and Nancy Ellen Brown Apr. 1982 28 p refs
(DE82-905763; NP-2905763) Avail: NTIS HC A03/MF A01

Renewable energy projects in Hawaii are reviewed as follows: geothermal energy, ocean energy, biomass, wind energy, direct solar energy, hydroelectric and other energy. DOE

N83-28669# Stanford Univ., Calif. Lab. for High Temperature Gasdynamics.

ACOUSTIC AND ENTROPY WAVES IN A COMBUSTION MHD GENERATOR Ph.D. Thesis

Tad Decatur Simons Jun. 1982 192 p refs
(Contracts DE-AC01-80ET-15611; EX-76-C-01-2341)
(DE82-017155; DOE/ET-15611/T5; HTGL-203) Avail: NTIS HC A09/MF A01

Simultaneous, sensitive, high frequency measurements of pressure and temperature fluctuations associated with traveling acoustic and entropy pulses were made in a combustion MHD generator under conditions of applied magnetic field (up to 2.2 Tesla) and moderate current density (up to 1.0 amp per square centimeter). The experimental observations and a closed form analytical description of the magneto-acoustic interaction suggest that nonideal phenomena, including near electrode phenomena, heat transfer, and possible secondary flows can substantially inhibit wave growth or attenuation caused by magneto-acoustic instabilities. Disturbances in the plasma temperature and pressure were created by the rapid discharge of a capacitor into the moving conducting plasma. Inside the generator, transient measurements were taken at three locations using a probe-tube microphone for pressure measurements, a fiber-optic luminosity probe for relative temperature measurements, and transverse mounted voltage pins to measure local voltage profiles. DOE

N83-28670# Westinghouse Electric Corp., Pittsburgh, Pa. Chemical Engineering Dept.

ASSESSMENT OF DEPOSITION FOR POWER-PLANT MOLTEN-CARBONATE FUEL CELLS

Richard A. Wenglarz 15 Mar. 1982 28 p refs
(Contract DE-AM06-77RL-00600)
(DE82-013398; DOE/RL-00600/T2; REPT-82-9E3-EGGCP-P2)
Avail: NTIS HC A03/MF A01

Particulate deposition in molten carbonate fuel cell anodes is addressed for operation with future coal gasification power plants. Power plant systems factors affecting deposition are explored such as gas cleanup requirements for particulate removal and gasifier product gas composition differences for various gasifier types and operational modes (air blown versus oxygen blown). Effects of fuel cell characteristics (including average cell current density and fuel utilization) on anode deposition are also quantified. Particulate effects on molten carbonate fuel cell anode performance may not be as detrimental as perhaps perceived in the past. Gas cleanup to remove virtually all particles larger than one micron in diameter is expected to prevent or at least greatly reduce anode deposition. However, cathode deposition in molten carbonate fuel cells should be evaluated in the future since cathodes are likely more prone to deposition than anodes even though cathode channel particle concentrations are much lower. DOE

N83-28671# Brookhaven National Lab., Upton, N. Y.

HEATING-SEASON THERMAL PERFORMANCE OF THE BROOKHAVEN HOUSE

H. T. Ghaffari and R. F. Jones 1982 7 p refs Presented at the American Sect. of the Intern. Solar Energy Soc. Renewable Challenge Conf. and Exhibition, Houston, Tex., 1-5 Jun. 1982
(Contract DE-AC02-76CH-00016)
(DE82-015808; BNL-31268; CONF-820629-11) Avail: NTIS HC A02/MF A01

In the Brookhaven Natural Thermal Storage House, a superinsulated envelope, passive solar collectors, and a variety of energy conservation methods are utilized. The thermal performance of the house is evaluated from the data acquired during the 80-81 heating season. The thermal exchange relating to heat loss and gain from the living spaces passive solar contributions, and the thermal storage of the structure are identified and quantified. Several thermal performance ratios and correlation factors are introduced. The average diurnal characteristics of these parameters are then tabulated, and their monthly average hourly values are plotted. Finally, the overall seasonal factors are identified and analyzed. DOE

N83-28672# Ebasco Services, Inc., New York.

TECHNOLOGY ASSESSMENT: MUNICIPAL SOLID WASTE AS A UTILITY FUEL Final Report

M. I. Neparstek and G. A. Cymny May 1982 295 p Sponsored by EPRI
(EPRI Proj. 1255-3)
(DE82-905355; EPRI-CS-2409) Avail: NTIS HC A13/MF A01

This study updates a 1974 EPRI technology assessment of municipal solid waste (MSW) as a utility fuel. An independent and consistent assessment of the development status and conceptual design and economics is presented for the following refuse-to-electricity technologies; mass burning of MSW in a dedicated boiler; preparation of coarse RDF and firing in a dedicated boiler; preparation of wet RDF and firing in a dedicated boiler; preparation of fluff RDF and cofiring with coal in a utility boiler; and preparation of dust RDF and cofiring with coal in a utility boiler. The generated steam is used to drive a turbine-generator and produce electricity. Utility ownership and financing are assumed for the coal-fired power plant used for RDF cofiring and the turbine generators driven by refuse-generated steam. Municipal ownership is assumed for the RDF preparation facilities and the MSW mass burning and RDF-fired dedicated boilers. DOE

N83-28673# Oak Ridge National Lab., Tenn. Energy Div.

WASTE-HEAT DISPOSAL FROM US GEOTHERMAL POWER PLANTS: AN UPDATE

Roy C. Robertson 1982 18 p refs Presented at the Intern. Conf. on Geothermal Energy, Florence, 11-14 May 1982; sponsored by the British Hydromech. Res. Assoc.
(Contract W-7405-eng-26)
(DE82-015699; CONF-820506-5) Avail: NTIS HC A02/MF A01

Some of the more interesting and significant methods that are currently being studied in the US for reducing waste heat dissipation system costs and water consumption are: (1) allowing plant power output to vary with ambient conditions; (2) use of ammonia to transport waste heat from the turbine condenser to air-cooled coils; (3) development of a plastic-membrane type wet/dry tower; (4) marketing of steam turbines that can tolerate a wider range of back pressure; (5) use of circulating water storage to delay heat dissipation until more favorable conditions exist; (6) development of tubes with enhanced heat transfer surfaces to reduce condenser capital costs; and (7) use of evaporative condensers to reduce costs in binary cycles. Many of these projects involve large scale tests that are now fully installed and producing some preliminary data. DOE

N83-28674# Engineering and Economics Research, Inc., Falls Church, Va.

HYDROTHERMAL RESEARCH AND DEVELOPMENT ASSESSMENT. TASK FORCE REPORT: PROJECTIONS FOR ELECTRIC SYSTEMS

May 1982 107 p refs
(Contract DE-AC07-80ID-12154)
(DE82-017013; DOE/ID-12154/T1) Avail: NTIS HC A06/MF A01

It is estimated that high temperature (greater than 150 C or 300 F) hydrothermal resources in the western United States have the potential for producing about 140,000 megawatts of electric power for 30 years. The extent to which these resources might be utilized over the next 20 years was evaluated and the probable impact of Federal programs on the utilization was assessed. The R and D assessment team interviewed industry personnel to determine the nature and the relative significance of investment decision criteria for developers and utilities. The results of these interviews were used to develop a probabilistic model to simulate the investment decision behavior of these two groups toward hydrothermal resources. Estimations of the characteristics of

anticipated available resources (e.g., temperature, salinity, depth) and predictions of the geographic distribution of resource discoveries were based upon the characteristics and distribution of known reservoirs. DOE

N83-28675# Engineering and Economics Research, Inc., Falls Church, Va.
HYDROTHERMAL RESEARCH AND DEVELOPMENT ASSESSMENT. TASK FORCE REPORT: PROJECTIONS FOR DIRECT-HEAT APPLICATIONS
Apr. 1982 105 p refs
(Contract DE-AC07-80ID-12154)
(DE82-017012; DOE/ID-12154/T2) Avail: NTIS HC A06/MF A01

Low and moderate temperature hydrothermal resources suitable for direct heat applications were identified in 37 states. The extent to which three resources might be used over the next 20 years were evaluated and the probable impact of Federal programs on hydrothermal resource utilization was assessed. The use types that comprise the bulk of the market were determined. Representative firms and municipalities were interviewed to determine their willingness to use hydrothermal energy, and to determine the investment decision criteria that would influence their actions. DOE

N83-28676# Coury and Associates, Inc., Lakewood, Colo.
GEOTHERMAL UTILIZATION AT CASTLE OAKS SUBDIVISION, CASTLE ROCK, COLORADO Final Report
Kenneth L. Garing, Glenn E. Coury, and Steven W. Goering Apr. 1982 39 p refs
(Contract DE-AC07-76ID-01570)
(DE82-013644; EGG-2154) Avail: NTIS HC A03/MF A01

Designs of geothermal systems for using warm water from four aquifers of the Denver Basin are presented. Advantages of using heat pumps with the geothermal resource are discussed. Two design cases, one with separate heat load and heat pump, and the other with the heat pump and heat load located at the well site are evaluated in terms of pump costs, opeating costs, and payback periods. The 20 year delivered energy costs for the two geothermal systems would be slightly less than those for natural gas ($5.64 to $6.42 versus $6.70 per million Btu). DOE

N83-28677# BDM Corp., Albuquerque, N. Mex.
GEOTHERMAL COMPLETION TECHNOLOGY LIFE-CYCLE COST MODEL (GEOCOM), VOLUME 1. VOLUME 2: USER INSTRUCTION MANUAL Final Report
E. R. Anderson, W. C. Hoessel, A. J. K. Mansure, and P. McKissen (Keplinger Operating Co., Denver) Jul. 1982 214 p refs
(Contract DE-AC04-76DP-00789)
(DE82-018567; SAND-82-7006) Avail: NTIS HC A10/MF A01

Just as with petroleum wells, drilling and completing a geothermal well at minimum original cost may not be the most cost effective way to exploit the resource. The impacts of the original completion activities on production and costs later in the life of the well must also be considered. In order to evaluate alternate completion and workover technologies, a simple computer model has been developed to compare total life-cycle costs for a geothermal well to total production or injection. Volume 1 discusses the mechanics of the model and then presents detailed results from its application to different completion and workover questions. Volume 2 is the user instruction manual. DOE

N83-28678# Sandia Labs., Albuquerque, N. Mex.
ANALYSIS OF MAGMA-THERMAL CONVERSION OF BIOMASS TO GASEOUS FUEL
T. M. Gerlach Feb. 1982 55 p refs
(Contract DE-AC04-76DP-00789)
(DE82-009351; SAND-82-0031) Avail: NTIS HC A04/MF A01

A wide range of magma types and pluton geometries believed to occur within the upper 10 km of the crust provide suitable sources of thermal energy for conversion of water-biomass mixtures to higher quality gaseous fuel. Gaseous fuel can be generated within a magma body, within the hot subsolidus margins of a magma body, or within surface reaction vessels heated by thermal energy derived from a magma body. The composition, amount, and energy content of the fuel gases generated from water-biomass mixtures are not sensitive to the type, age, depth, or temperature of a magma body thermal source. The amount and energy content of the generated fuel is almost entirely a function of the proportion of biomass in the starting mixture. CH4 is the main gas that can be generated in important quantities by magma thermal energy under most circumstances. The rates at which gaseous fuels can be generated are strongly dependent on magma type. The highest fuel generation rates, for any particular magma body, will be achieved at the lowest possible reaction vessel operating temperature that does not cause graphite deposition from the water-biomass starting mixture. DOE

N83-28679# Sandia Labs., Albuquerque, N. Mex. Exploratory Batteries Div.
THIN-CELL TECHNOLOGY FOR LI(SI/FeS2 THERMAL BATTERIES
Jimmie Q. Searcy and James R. Armijo 1982 17 p refs Presented at the 30th Power Sources Symp., Atlantic City, 7 Jun. 1982
(Contract DE-AC04-76DP-00789)
(DE82-008921; SAND-81-2441C; CONF-820621-1) Avail: NTIS HC A02/MF A01

Sandia National Laboratories (SNL) has been developing Li(Si)/FeS2 thermal batteries for several years as an alternative to the older Ca/CaCrO4 system. Batteries made with Li(Si)/FeS2 have proven to be more predictable, more reliable, more capable, and more forgiving than those using the older system. Since the voltage per cell for Ca/CaCrO4 is about 0.5 V higher than that for Li(Si)/FeS2, the new system requires more cells to obtain a specified voltage. Furthermore, unlike the Ca/CaCrO4 technology, a cell in the new technology must incorporate a separator layer. Consequently, it has become necessary to develop a thin cell technology for Li(Si)/FeS2 thermal batteries in order to replace Ca/CaCrO4 in applications that require small batteries. A current program to develop such a technology is summarized and battery discharge data representative of the most recent advances are given. DOE

N83-28680# Sandia Labs., Albuquerque, N. Mex.
CHARACTERIZATION OF MATERIALS FOR Ca/CaCrO4 THERMAL BATTERIES
Ronald A. Guidotti, Frederick W. Reinhardt, and Robert L. Poole (GE, St. Petersburg, Fla.) 1982 15 p refs Presented at the 30th Power Sources Symp., Atlantic City, 7 Jun. 1982
(Contract DE-AC04-76DP-00789)
(DE82-009028; SAND-81-2442C; CONF-820621-4) Avail: NTIS HC A02/MF A01

The performance of pelletized Ca/CaCrO4 thermal batteries is known to be sensitive to processing of the catholyte or DEB mix, which consists of CaCrO4 depolarized(D), KCl-LiCl eutectic electrolyte(E), and SiO2 binder(B). The chemical composition of the DEB mix affects the electrochemical behavior. Little work has been reported, however, for the characterization of DEB mixes in relation to their performance in Ca/CaCrO4 thermal batteries. Considerable variability of battery performance has also been observed when different lots of sheet calcium are used with the same DEB. The causes for this behavior remain elusive. In an effort to resolve these discrepancies in materials behavior, a study was carried out to characterize DEB powders and pellets and, to a lesser extent, sheet calcium with the primary objective of correlating observed battery performance to easily measured physical and chemical properties. DOE

N83-28681# Sandia Labs., Albuquerque, N. Mex.
GAS EVOLUTION STUDY OF Ca/CaCrO4 THERMAL BATTERIES DURING DISCHARGE
Frank B. Burns, Ronald A. Guidotti, Frederick W. Reinhardt, and Philip J. Rodacy 1982 17 p refs Presented at the 30th Power Sources Symp., Atlantic City, 7 Jun. 1982
(Contract DE-AC04-76DP-00789)
(DE82-008919; SAND-81-2450C; CONF-820621-3) Avail: NTIS

HC A02/MF A01

The gases which are generated upon activation and during discharge of Ca/CaCrO4 thermal batteries are of interest, as they can provide insight into the reactions which are occurring. This, in turn, can result in an increased understanding of the discharge mechanism. Mass spectrometry (MS) was employed in limited studies to examine the overgas composition of discharge Ca/CaCrO4 thermal batteries. No data have been reported, however, for the gas composition throughout the activated life of such batteries. The study was undertaken to obtain gas-composition profiles on a real time basis during the discharge of Ca/CaCrO4 thermal batteries and to identify, if possible, the relative contributions made by the various battery components. The gas evolution information was then evaluated for possible correlation to the observed electrochemical performance. Results are presented and discussed. DOE

N83-28682# Gould, Inc., Rolling Meadows, Ill.
MAINTENANCE-FREE, DEEP-DISCHARGE, LEAD-ACID BATTERY FOR PHOTOVOLTAIC APPLICATIONS
Joseph Szymborski Apr. 1982 99 p refs
(Contract DE-AC04-76DP-00789)
(DE82-014614; SAND-82-7026) Avail: NTIS HC A05/MF A01

Progress in the development, design, fabrication, and testing of totally maintenance-free sealed lead-acid batteries suitable for the deep-discharge regimes of solar photovoltaic applications is reported. The 6-volt, 100-ampere-hour battery was designed to meet these additional key design goals: 6-h nominal discharge rates; 80% depth-of-discharge daily duty cycle; 2000 cycles to an 80% depth-of-discharge; recharge in less than 8 h; 80% roundtrip energy efficiency; and self-discharge rate of less than 1% per week. Totally maintenance-free sealed operation was achieved by designing the cells so that only oxygen is generated on charge. The cells in this battery are fabricated with positive grids cast from a low antimony alloy in order to achieve both maintenance-free operation and good deep cycle performance. Various cycle life tests and tests to determine the tolerance of the battery to operation and storage at various states-of-charge and over a wide range of temperatures were performed. The charging parameters to adequately recharge the battery while minimizing overcharge and gassing were extensively studied. DOE

N83-28683# Oak Ridge National Lab., Tenn. Engineering Technology Div.
DISTRICT HEATING/COGENERATION APPLICATION STUDIES FOR THE MINNEAPOLIS-ST. PAUL AREA: ECONOMIC COMPARISON OF NEW COAL-FUELED, COGENERATION POWER PLANTS FOR DISTRICT HEATING AND ELECTRICITY-ONLY AND HEAT-ONLY POWER PLANTS
G. A. Englesson, G. F. Pavlenco, J. S. Hodson, N. H. Lee, A. N. Garcia, and B. J. Menaker May 1982 135 p refs
(Contract W-7405-eng-26)
(DE82-016598; ORNL/TM-6830/P8) Avail: NTIS HC A07/MF A01

Cogeneration/district heating plants equipped with condensating-tail turbines and full-sized heat rejection systems cost approximately 3% more than comparable sized electric-only plants. Bus bar electricity costs of cogeneration plants are comparable with those of an 800-MW(e) electric-only plant. The cost of bus bar electricity is practically independent of the two sites evaluated, but the heat delivered to the load center from the Coon Rapids site is 30 to 50% more costly than the heat delivered from the High Bridge site because of the greater transmission distance from the Coon Rapids site. The cogeneration plant operating at its assigned capacity factor will provide heat and electricity at the plant boundary at significantly less cost than will separately sized heat-only and electricity-only plants because of (1) better fuel utilization, (2) common use of facilities, and (3) the sale of two products - heat and electricity. DOE

N83-28684# Mechanical Technology, Inc., Latham, N. Y. Stirling Engine Systems Div.
AUTOMOTIVE STIRLING ENGINE MARKET AND INDUSTRIAL READINESS PROGRAM (MIRP), PHASE 1
May 1982 293 p refs
(Contract DE-AC02-80CS-50214)
(DE82-017107; MTI-010) Avail: NTIS HC A13/MF A01

A program, begun in 1978, has the goal of transferring Stirling engine technology from United Stirling of Sweden to the US and, then, following design, fabrication, and prototype testing, to secure US manufacturers for the engine. The ultimate objective is the large-scale commercial use of the Automotive Stirling Engine (ASE) by the year 2000. The fist phase of the Market and Industrial Readiness Program for the ASE was concerned with defining the market, product, economic and technical factors necessary to be addressed to assure a reasonable chance of ultimate commercial acceptance. Program results for this first phase are reported and discussed. These results pertain to licensing strategy development, economic analysis, market factors, product planning, market growth, cost studies, and engine performance as measured by fuel economy using conventional fuels and by vehicle speed and acceleration characteristics. DOE

N83-28685# Sandia Labs., Albuquerque, N. Mex.
COMPARATIVE EVALUATION OF SURFACE AND DOWNHOLE STEAM-GENERATION TECHNIQUES
C. Hart 1982 13 p refs Presented at the Enhanced Oil Recovery Symp., Tulsa, Okla., 4 Apr. 1982
(Contract DE-AC04-76DP-00789)
(DE82-011136; SAND-81-2244C; CONF-820419-1) Avail: NTIS HC A02/MF A01

The application of heat to reservoirs containing high API gravity oils can substantially improve recovery. Although steam injection is currently the principal thermal recovery method, heat transmission losses associated with delivery of the steam from the surface generators to the oil bearing formation has limited conventional steam injection to shallow reservoirs. The objective of the Department of Energy's Project DEEP STEAM is to develop the technology required to economically produce heavy oil from deep reservoirs. The tasks included in this effort are the development and evaluation of thermally efficient delivery systems and downhole steam generation systems. The technical and economic performance of conventional surface steam drives, which are strongly influenced by heat losses are compared. The selection of a preferred technology based upon either total efficiency or cost is found to be strongly influenced by reservoir depth, steam mass flow rate, and sandface steam quality. DOE

N83-28686# Mission Research Corp., Albuquerque, N. Mex.
SILICON-SOLAR-CELL DAMAGE FROM ELECTRICAL OVERSTRESS
R. L. Pease, J. R. Barnum, W. V. Vulliet, V. A. J. vanLint, and T. F. Wrobel 1982 45 p refs Presented at the IEEE Ann. Conf. on Nucl. and Space Radiation Effect, Las Vegas, Nev., 20-22 Jul. 1982 Prepared in cooperation with Mission Research Corp., La Jolla, Calif. Prepared for Sandia Labs., Albuquerque, N. Mex.
(Contract DE-AC04-76DP-00789)
(DE82-018984; SAND-82-7072C; CONF-820708-4) Avail: NTIS HC A03/MF A01

An analytical model is developed to predict transient overstress failure currents in silicon solar cells and to experimentally measure the threshold failure currents in a variety of concentrator and flat plate cells. The model can be used to predict the failure current vs pulse width for pulse widths ranging from nanoseconds to milliseconds. The experimental verification of the model was performed in the range of interest for the lightning environment. The characteristics of the silicon solar cells modeled and tested are described. After the model development, the results of an experimental verification of the current distribution in the cell under pulsed current condition are given, as well as the experimental procedure used for failure testing and the results of the overstress tests with comparisons to the model predictions. DOE

N83-28687# Barry (Theodore) and Associates, Los Angeles, Calif.
PHOTOVOLTAIC SUBSYSTEM PRODUCTION COST MODEL (SAMIS) Final Report

Jul. 1982 51 p refs Prepared for Sandia Labs., Albuquerque, N. Mex.
(Contract DE-AC04-76DP-00789)
(DE82-018192; SAND-81-7049) Avail: NTIS HC A04/MF A01

A complete introduction to the SAMIS model is provided. The purpose of the model is to estimate the costs of manufacturing photovoltaic solar energy products. The model procedure for estimating the long run or steady-state manufacturing cost is divided into four submodels: manufacturing process submodel, factory construction and staffing algorithm, capital requirements submodel, and the financial model of the firm. The model has been applied by Sandia National Laboratories for DOE's National Photovoltaics Program to assess the commercial viability of new solar energy manufacturing processes. However, given the proper input data, the model structure is flexible enough to support the design and analysis of any manufacturing industry. This document explains what the model can and cannot do, and what data is required. An example for a photovoltaic power conditioning unit demonstrates the application of the model. DOE

N83-28688# Harvard Univ., Cambridge, Mass. Dept. of Chemistry.
OPTIMIZATION OF TRANSPARENT ELECTRODE FOR SOLAR CELLS Technical Progress Report, 15 Sep. 1981 - 15 Mar. 1982
Roy G. Gordon 1982 5 p
(Contracts DE-AC02-77CH-00178; EG-77-C-01-4042)
(DE82-015761; SERI/PR-9318-1-T4) Avail: NTIS HC A02/MF A01

A simple, sensitive, and reliable method for measuring the interfacial or contact resistance between tin oxide and silicon is reported. The method consists of depositing a doped tin oxide layer on a wafer of highly conductive single-crystal silicon. Metallic electrodes are applied to the surface of the tin oxide and to the opposite surface of the silicon. The coated and soldered wafer is then clamped between flat metallic electrodes, and the resistance between the electrodes is measured with an ohm meter. Corrections are estimated for the resistance of the wafer, the bulk of the tin oxide, and for the resistance at the indium-silicon and indium-tin oxide interfaces. The method is called the two-point interfacial resistance method. A four-point probe method was investigated which was less satisfactory than the two-point method. Both methods were applied to tin oxide coatings deposited on single crystal silicon wafers at 500 C. DOE

N83-28689# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.
FAST BIOMASS PYROLYSIS WITH AN ENTRAINED-FLOW REACTOR
Mark S. Bohn and Charles Benham Feb. 1982 29 p refs Presented at the AICHE 1982 Natl. Winter Meeting, Orlando, Fla., 28 Feb. 1982
(Contracts DE-AC02-77CH-00178; EG-77-C-01-4042)
(DE82-011266; SERI/TP-252-1398; CONF-820202-6) Avail: NTIS HC A03/MF A01

A tubular entrained flow reactor has been used to study the effect of process control variables on fast biomass pyrolysis. In this type of reactor, finely ground biomass particles are entrained by carrier gas and transported through a reactor tube which is heated to about 900 C. Biomass particles pyrolyze as a result of heat transfer from the reactor wall yielding a gas composed primarily of carbon monoxide, carbon dioxide, hydrogen, methane, and unsaturated hydrocarbons. In this experimental program three dependent variables, percent conversion to gas, gas composition, and process heat, have been measured as a function of several process control variables. These process variables include reactor temperature, carrier gas to biomass flow ratio, reactor residence time, biomass particle size, and reactor Reynolds number. The data allow one to design and predict the performance of large scale reactors and also elucidates heat transfer mechanisms in fast biomass pyrolysis. DOE

N83-28690# Sandia Labs., Albuquerque, N. Mex. Photovoltaic Systems Div.
PHOTOVOLTAIC SYSTEM DESIGN IN GRID-CONNECTED APPLICATIONS
Gary J. Jones 1982 4 p refs Presented at the Am. Sect. of the Intern. Solar Energy Soc. Conf., Houston, Tex., 1 Jun. 1982
(Contract DE-AC04-76DP-00789)
(DE82-012450; SAND-82-0923C; CONF-820629-6) Avail: NTIS HC A02/MF A01

The design of photovoltaic (PV) systems was traditionally done from the owner's viewpoint. This does not present a problem in central station applications but may result in misleading guidance for distributed system configurations. The results of the traditional design approach are contrasted with those obtained when the utility and application are viewed as a whole. The typical design assumes that on-site energy use must be maximized leading to a synergism between on-site loads and design optimization. This is shown to be a false requirement, resulting from considering only the system owner. When the system and utility are viewed together, the value of PV energy is found to be independent of the point of consumption. Load management, conservation, and passive solar design may affect energy use but have no impact on PV energy value. Furthermore, the value of PV energy is essentially the same for all systems, whether distributed or centralized. DOE

N83-28691# Sandia Labs., Albuquerque, N. Mex.
IMPACT OF PHOTOVOLTAIC-ARRAY CONVERSION EFFICIENCY ON SYSTEM ENERGY COST
G. J. Jones and H. N. Post 1982 23 p refs Presented at the Spring Meeting of the Electrochem. Soc., Montreal, 9 May 1982
(Contract DE-AC04-76DP-00789)
(DE82-014688; SAND-82-1119C; CONF-820508-2) Avail: NTIS HC A02/MF A01

The relationship between photovoltaic collector efficiency and total system cost is analyzed using the most recent data on subsystem costs. Results are compared with competitive system prices to determine minimum array efficiency requirements. Central power station results show a requirement for arrays with a 10 percent minimum efficiency even for inexpensive collectors. For intermediate applications, this required minimum drops to 6 to 7 percent for the same collectors. Residential systems would seem to allow much lower efficiencies but are probably constrained by the available roof area. DOE

N83-28692# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.
PHOTOVOLTAIC-SYSTEMS DEVELOPMENT: BEST LOCATIONS FOR NEAR-TERM RESIDENTIAL APPLICATIONS
Gregg Ferris, Gennifer Sussman, and Tom Thomas Jul. 1982 91 p refs
(Contracts DE-AC02-77CH-00178; EG-77-C-01-4042)
(DE82-018193; SERI/TR-254-1542) Avail: NTIS HC A05/MF A01

This study identifies urban locations where the development of residential photovoltaic energy systems can reasonably be expected in the near future. PV system costs and values used in the analysis are based on US Department of Energy estimates and forecast. The analysis assumes first that all state and federal policies affecting the price of PV systems in 1980-1981 will be in effect in 1984. Thus, DOE cost goals for PV systems are reduced to reflect various state and federal subsidies applicable in 1980-1981. The method used to identify likely urban areas is conjoint analysis. Each US (Continental) Standard Metropolitan Statistical Area's potential as a market for residential PV systems is determined first. Second, a small set of location descriptions are ranked according to the decision maker's evaluation of each location's market potential for residential PV systems. Fourth, the rankings assigned by the experts are evaluated by means of regression equations to derive weights for defining the relative importance of each set of location characteristics. DOE

N83-28693# Sandia Labs., Livermore, Calif. Large Power Systems Div.

SOLAR REPOWERING ASSESSMENT
J. C. Gibson Jun. 1982 57 p refs
(Contract DE-AC04-76DP-00789)
(DE82-017801; SAND-81-8015) Avail: NTIS HC A05/MF A01

Provided is the assessment of solar repowering studies that were completed by 1980. The ease of interfacing with existing plants, the interest expressed by plant managers in the central receiver concept, and the awareness on the part of industry of the need to develop alternative energy sources all point to near term high potential for solar central receiver technology. A major barrier to private investment appeared to be the need for larger experimental projects to establish actual costs and develop initial operating experience. DOE

N83-28694# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.
SOLERAS SOLAR-ENERGY CONTROLLED-ENVIRONMENT AGRICULTURE PROJECT
W. Luft, J. Froechtenigt, and A. Falatah May 1982 7 p refs Presented at the 17th Intersoc. Energy Conversion Eng. Conf., Los Angeles, 8 Aug. 1982
(Contract DE-AC02-77CH-00178)
(DE82-014266; SERI/TP-270-1588; CONF-820814-1) Avail: NTIS HC A02/MF A01

Three commercial size (5-ha), solar powered, controlled environment agriculture systems for hot, dry climates are described. The systems use brackish well water for cooling. The well water is desalinated for irrigation using reverse osmosis. Produce output ranges from 44 to 78 kg square m yr with an overall water consumption of 8 to 139 L/kg produce and electric energy consumption of 111 to 790 Wh/kg produce. The levelized cost ranges from $1.14 to $8.07 per kg of produce. DOE

N83-28695# Sandia Labs., Albuquerque, N. Mex. Solar Energy Projects Dept.
VARIATION OF COLLECTOR EFFICIENCY AND RECEIVER THERMAL LOSS AS A FUNCTION OF SOLAR IRRADIANCE
V. E. Dudley (EG&G, Inc.) and R. M. Workhoven 1982 13 p refs Presented at the ASME Solar Energy Conf., Albuquerque, N. Mex., 26 Apr. 1982
(Contract DE-AC04-76DP-00789)
(DE82-006942; SAND-82-0163C; CONF-820410-5) Avail: NTIS HC A02/MF A01

Efficiency and thermal loss of a parabolic trough concentrating solar collector have been measured for values of solar irradiance between 400 W/sq m and 100 W/sq m. Both parameters are shown to vary significantly with changing solar irradiance. Significant errors can result from improper use of currently published efficiency data. DOE

N83-28696# Sandia Labs., Albuquerque, N. Mex. Thermophysical Properties Div.
OPTICAL MODELING OF BLACK CHROME SOLAR-SELECTIVE COATINGS
James N. Sweet and Richard B. Pettit Jul. 1982 120 p refs
(Contract DE-AC04-76DP-00789)
(DE82-018576; SAND-82-0964) Avail: NTIS HC A06/MF A01

Various investigations of coating microstructure are reviewed and the results of these studies are used to develop a picture of the microstructure of the black chrome films plated from the Harshaw Chromonyx bath. In this model, the black chrome film is composed of roughly spherical particles which may tend to cluster together. These particles in turn are composed of small crystallites of metallic chrome and various oxides of chrome. The film void volume fraction appears to be $>$ or $=$ 0.6. The microstructural picture has been idealized to facilitate calculations of the spectral reflectance for films deposited onto nickel substrates and for freestanding or stripped films. In the idealized model, the metallic chromium is assumed to be in the form of spherical crystallites with concentric shells Cr_2O_3 and the crystallite volume fraction is assumed to increase with depth into the film. Various experimental data are utilized to define film thickness, average volume fraction of Cr + Cr_2O_3, and volume ratio of Cr to Cr + Cr_2O_3. DOE

N83-28697# Sandia Labs., Albuquerque, N. Mex.
SECOND-GENERATION-HELIOSTAT OPTIMIZATION STUDIES Final Report
May 1982 110 p
(Contract DE-AC04-76DP-00789)
(DE82-017058; SAND-82-8175; MCR-82-1700) Avail: NTIS HC A06/MF A01

Specific technological areas investigated were: designing the heliostat for survival strength rather than stiffness and reducing the operational wind requirements as dictated by this design approach; reducing the pointing accuracy and/or beam quality required for some fraction or all of the heliostat field; modifying the operational temperature range; relaxing the rate at which the heliostat must move in the slew mode; using alternate beam safety strategies; analyzing actual wind data for selected sites in the southwest United States vs. the heliostat design specification survival wind requirements; estimating heliostat damage for winds in excess of the design specification over a 30 year period; evaluating the impact of designing the heliostat for higher wind loads; and investigating the applicability to heliostat design of the standard engineering practices for designing buildings. DOE

N83-28698# Geokinetics, Inc., Salt Lake City, Utah.
INVESTIGATION OF THE GEOKINETICS HORIZONTAL IN-SITU OIL-SHALE-RETORTING PROCESS Annual Report, 1981
Edward C. Costimiris, ed. Jul. 1982 169 p
(Contract DE-FC20-78LC-10787)
(DE82-018581; DOE/LC-10787/89; AR-5) Avail: NTIS HC A08/MF A01

The objective of the Geokinetics in situ shale oil project is to develop a true in situ process for recovering shale oil using a fire front moving in a horizontal direction. The project is conducted at a field site, Kamp Kerogen, Utah. During 1981, one full sized retort was blasted and the following three retorts were processed: (1) retort No. 24 operations were continued until July 23; (2) retort No. 23 was ignited and processed during the calendar year; (3) retort No. 25 was ignited and burned for 77 days during 1981. DOE

N83-28699# Council of State Governments, Atlanta, Ga.
A DEVELOPER'S GUIDE TO SMALL-SCALE HYDROELECTRIC DEVELOPMENT IN THE SOUTHEAST
Steve Day, Helen Grant, Jill Paukert, Gould Hagler, and Colleen Cousineau, ed. Jun. 1982 133 p
(Contract DE-AC44-80R4-20004)
(DE82-018722; DOE/R4-20004/T7) Avail: NTIS HC A07/MF A01

Precise information is provided to small scale hydroelectric developers on the federal and state permitting processes in the eight states of Region IV of US Department of Energy, i.e., Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, and Tennessee. The procedures for each permit are described in the text and flow charts are provided at the end of each chapter. Information is also included on state financing and taxation incentives which may apply to small hydro and on the public Utility Policies Act as it applies to small hydro. DOE

N83-28700# Arizona State Univ., Tempe. School of Engineering.
TERRESTRIAL PHOTOVOLTAIC POWER SYSTEMS WITH SUNLIGHT CONCENTRATION Annual Progress Report, 1980 - 1981
C. E. Backus and R. W. Sanderson May 1982 102 p refs
(Contract DE-AC04-76DP-00789)
(DE82-017678; DOE/NBM-2017678) Avail: NTIS HC A06/MF A01

Arizona State University's concentrator cell test facility provides a source as a proving ground for concentrator cell test techniques. Test procedures and results obtained at this facility are summarized. An investigation dealing with both the calibration accuracy of reference cells and the need for matching the spectral response characteristics of the reference cell to the test cell are described. In addition, a technique for predicting short-circuit

currents of silicon solar cells under any reference irradiance condition is outlined, with sample theoretical and experimental data included to show the accuracy and repeatability of the technique. An investigation is presented to evaluate the linearity of several concentrator solar cells with irradiance by measuring cell spectral response at various levels of irradiance. Results indicate that the assumed linearity of solar cell short-circuit current is not strictly valid for most concentrator cells. DOE

N83-28701# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Stuttgart (West Germany).
SSPS WORKSHOP ON FUNCTIONAL AND PERFORMANCE CHARACTERISTICS OF SOLAR-THERMAL PILOT PLANTS. PART 1: RESULTS OF THE DCS-PLANT SESSION
A. Kalt 1982 99 p
(Contract DE-AC04-76DP-00789)
(DE82-018128; DOE/NBM-2018128-Pt-1; SSPS-TR-1/82-Pt-1)
Avail: NTIS HC A05/MF A01

After a brief description of the workshop and its objectives, 10 solar thermal power plants are described briefly. For each plant project data, plant environmental conditions, collector/heliostat field description and data, energy storage system description and data, steam generator/power conversion system description and data, auxiliary systems and special devices/operation and maintenance, efficiency data, and plant performance are given. DOE

N83-28702# Nevada Univ., Las Vegas. Div. of Earth Sciences.
GEOTHERMAL ASSESSMENT OF THE MX DEPLOYMENT AREA IN NEVADA Final Report
Dennis T. Trexler, James L. Bruce, Delores Cates, and Cameron Covington Jun. 1982 137 p refs
(Contract DE-AC08-81NV-10187)
(DE82-019198; DOE/NE-10189/1) Avail: NTIS HC A07/MF A01

A preliminary geothermal resource assessment of the MX deployment area in Nevada focused on Coyote Spring Valley in southeastern Nevada. Initially, an extensive literature search was conducted and a bibliography consisting of 750 entries was compiled covering all aspects of geology pertaining to the study area. A structural study indicates that Coyote Spring Valley lies in a tectonically active area which is favorable for the discovery of geothermal resources. Hot water may be funneled to the near surface along an extensive fracture and fault system which appears to underlie the valley, according to information gathered during the literature search and aerial photo survey. A total of 101 shallow temperature probes were emplanted in Coyote Spring Valley. Three anomalous temperature points all lying within the same vicinity were identified in the north central portion of the valley near a fault. DOE

N83-28703# Geological Survey, Denver, Colo.
GEOTHERMAL RESOURCE ASSESSMENT OF RANGER WARM SPRING, COLORADO, RESOURCES SERIES 24
Ted G. Zacharakis, Richard Howard Pearl, and Charles D. Ringrose 1982 72 p refs
(Contract DE-AS07-77ET-28365)
(DE83-009097; DOE/ET-28365/26) Avail: NTIS HC A04/MF A01

The delineation of the geological features controlling the occurrence of geothermal resources in Colorado are discussed. The program consists of literature search, reconnaissance geological and hydrogeologic mapping and geophysical and geochemistry surveys. During 1980 and 1981 geothermal resource assessment were conducted in the Cement Creek Valley south of Crested Butte. In this valley are two warm springs, Cement Creek and Ranger. The temperature of both springs is 77 to 790F and the discharge ranges from 60 to 195 gallons per minute. Electrical resistivity and soil mercury surveys were conducted at Ranger Warm Springs. The bedrock of the area consists of sedimentary rocks ranging in age from precambrian to recent. Several faults with displacements of up to 3000 ft are found and one of these faults passes close to the Ranger Warm Springs. The electrical resistivity survey indicates that the water of Ranger Warm Springs are moving up along a buried fault which parallels Cement Creek. DOE

N83-28704# Geological Survey, Denver, Colo.
GEOTHERMAL RESOURCE ASSESSMENT OF THE STEAMBOAT-ROUTT HOT SPRINGS AREA, COLORADO, RESOURCE SERIES 22
Richard Howard Pearl, Ted G. Zacharakis, and Charles D. Ringrose 1983 95 p refs
(Contract DE-AS07-77ET-28365)
(DE83-009096; DOE/ET-28365/24) Avail: NTIS HC A05/MF A01

The geological features controlling the occurrence of the thermal waters (temperatures in excess of 680F in the area at Steamboat Springs and 8 miles north at Routt Hot Springs were delineated. Thermal waters from Heart Spring, the only developed thermal water source in the study area, are used in the municipal swimming pool in Steamboat Springs. The assessment program consisted of: dipole dipole, Audio magnetotelluric, telluric, self potential and gravity geophysical surveys, soil mercury and soil helium geochemical surveys; shallow temperature measurements; and preparation of geological maps. It is shown that all the thermal springs appear to be fault controlled. It appears that Heart Spring in Steamboat Springs is hydrologically related to the Routt Hot Springs. Thermal waters were encountered during the construction of the new high school on the north side of Steamboat Springs. Strawberry Park also appears to be warmer than the surrounding country side. Geological mapping determined that a major fault extends from the Routt Hot Springs area into Strawberry Park. DOE

N83-28705# Research Triangle Inst., Research Triangle Park, N.C. Energy Systems Dept.
SIMULATION OF THE PEAK-SHIFTING POTENTIAL OF THERMAL-ENERGY-STORAGE SYSTEMS FOR RESIDENCES IN THE TVA REGION
Richard Johnson (North Carolina State Univ.) Feb. 1982 16 p refs
(DE82-902534; TVA/OP-EDT-81-38) Avail: NTIS HC A02/MF A01

The simulation and analysis of the load shifting potential of a phase change thermal energy storage (TES) system are described. The interrelationships between peak demand shifting, total energy consumption, and electric utility/customer benefits are explored. Peak shifting criteria are discussed. Possible load management strategies for operating the TES system for residential applications are outlined, and various modes of operation are simulated. Histograms of the time of day average electrical demand over a heating session are presented; and the results of the simulations are analyzed for peak shifting capabilities and total energy consumption, and are compared to resistive heating and heat pump base cases. The performance characteristics of three heat pump/resistive element/phase change material (PCM) storage configurations are studied and evaluated. Results indicate that the load shifting capability of thermal energy storage systems could come at the expense of total energy consumption if the system is not carefully configured. DOE

N83-28706# McDonnell-Douglas Astronautics Co., Huntington Beach, Calif. Solar Collector Subsystem.
OPTIMIZATION OF THE 2ND-GENERATION HELIOSTAT AND SPECIFICATION
J. J. Dietrich, R. K. Knowles, K. W. Stone, D. A. Steinmeyer, and J. H. Nourse May 1982 162 p refs
(Contract DE-AC04-76DP-00789)
(DE82-018317; SAND-82-8181) Avail: NTIS HC A08/MF A01

A study was performed to investigate and identify heliostat cost reductions that would result from modifications to the Sandia Second Generation Heliostat Specification. A parametric analysis of specification requirements and cost benefits was done by determining the effectiveness of the change in terms of heliostat field cost per unit intercepted annual energy on the receiver. The study considered the areas of reduced operational wind require-

ments, effects of heliostat beam pointing the beam quality requirements, operational range temperature effects, survival wind requirements and criteria, aspect ratio effects, and slew rates. Also considered were the effects of mixing two heliostats with different performance levels in the 50 MWe field and a damage/cost estimate for survival of the baseline heliostat to higher wind loads than the specification. An investigation and analysis of the safety issues associated with beam control during normal heliostat operating and stow conditions was performed using analytical equations for both single and multiple heliostats. DOE

N83-28707# Argonne National Lab., Ill.
DIRECT SOLAR STEAM-GENERATING SYSTEM
Josip Vresk 1982 8 p Presented at the 3rd Intern. Symp. on Energy Conservation in the Built Environ., Dublin, Ireland, 30 Mar. 1982
(Contract W-31-109-eng-38)
(DE83-008661; CONF-830309-6) Avail: NTIS HC A02/MF A01

A new technology that generates steam by the use of solar energy is described. Steam is generated directly in the solar collectors. The advantages of direct solar steam generation are compared with the methods of indirect solar steam generation. Schematics and modes of operation of a demonstration system are presented. Feasibility of the concept, and how to obtain necessary design parameters, was established. The feasibility of direct solar steam generation is shown. This concept is suitable for generating low pressure steam. The major applications are expected to be in process steam, absorption cooling, and steam heating. DOE

N83-28708# California Univ., Livermore. Lawrence Livermore Lab.
ENERGY AND TECHNOLOGY REVIEW
Paul S. Brown, ed., Richard B. Crawford, ed., Mary Ann Esser, ed., Patricia L. Lien, ed., Eleanor M. ONeal, ed., and Palmer T. VanDyke, ed. Jan. 1983 39 p refs
(Contract W-7405-eng-48)
(DE83-009213; UCRL-52000-83-1) Avail: NTIS HC A03/MF A01

Predictive models for forecasting hazards resulting from LNG spills were evaluated. It is verified that a large cloud behaves quite differently from a small one. Clouds enriched by heavier hydrocarbons resulting from differential boiloff may be more easily detonated. The RPT explosions may play an important role in determining the outcome of a spill. Model calculations were compared with the data from cloud dispersion tests. The sophisticated three dimensional FEM3 model successfully accounted for cloud bifurcation and terrain effects and gave accurate values for measured downwind LFL. The simpler cross wind averaged SLAB model also gave reasonable LFL values. The comparisons also revealed serious deficiencies in Gaussian models. It is confirmed that 40-m (3) LNG experiments mark a threshold for observing large cloud effects. It is suggested that models that can reproduce the 40-m (3) results should be used to predict the behavior of larger spills. DOE

N83-28709# Sandia Labs., Livermore, Calif. Systems Research Div.
ECONOMICS OF SCALE IN THE PRODUCTION OF STEAM WITH SOLAR THERMAL-FOSSIL BOILER HYBRID SYSTEMS
F. R. Hansen, D. L. Lindner, and J. Vitko, Jr. Mar. 1983 99 p refs
(Contract DE-AC04-76DP-00789)
(DE83-009359; SAND-83-8202) Avail: NTIS HC A05/MF A01

Levelized energy costs for steam plants in the size range 15 MM Btu/h to 400 MM Btu/h were estimated for steam produced by several different technologies, including stand alone oil and coal burning plants and solar central receiver fossil boiler hybrid plants. Models for the costs of plant subsystems used in these calculations are presented. Designs of the solar fossil hybrids examined were optimized for solar fraction and amount of thermal storage used by simulation of plant operation. The resulting levelized energy costs and their sensitivity to various modelling parameters are discussed. DOE

N83-28710# Systems Technology Corp., Xenia, Ohio.
ENERGY RECOVERY FROM THE EFFLUENT OF PLANTS ANAEROBICALLY DIGESTING URBAN SOLID WASTE
Mar. 1983 100 p refs
(Contracts DE-AC01-78CS-20451; EM-78-C-01-5300)
(DE83-009183; DOE/CS-20451/T1) Avail: NTIS HC A05/MF A01

The parameters of concentration, time, temperature, and pH to find optimum conditions for enzymatically converting unreacted cellulose in the effluent of an anaerobic digester to glucose for ultimate conversion to methane, and then to project the economics to a 100 tons per day plant was studied. The amount of cellulose hydrolysis for enzyme concentrations from 5 to 1000 CIU/gram of substrate using either filter paper or anaerobically digested municipal solid waste (MSW) reacted over periods of time of from 0 to 72 hours is illustrated. The feasibility of recycling enzymes by ultrafilter capture was studied and it is shown that the recovered enzyme is not denatured by any of several possible enzyme loss mechanisms chemical, physical, or biological. Although rather stable enzyme substrate complexes seem to be formed, various techniques permit a 55% enzyme recovery. Posttreatment of digested MSW by cellulase enzymes produces nearly a threefold increase in biomethanation. The value of the additional methane produced in the process is not sufficient to support the cost of enzymes. DOE

N83-28711# Hawaii Univ., Manoa. Natural Energy Inst.
WIND-ENERGY BATTERY-STORAGE PROJECT, PHASE 1 Final Report
D. Richard Neill and George D. Curtis Jan. 1983 100 p refs
(Contract DE-AC04-76DP-00789)
(DE83-009389; SAND-82-7211) Avail: NTIS HC A05/MF A01

A program which involves data collection, development of a computer model and use of the data in the model to simulate use of the WEBS in a specific locality is described. The data collection involved hourly wind samples, load data, and performance and cost information on candidate equipment. The model enables the user to call these data from files, configures the systems, and obtain performance measures and operational statistics. Comparative economic analyses on probable configurations indicate that an array of wind machines can be cost effective but that battery storage is economically marginal unless it can interact usefully with the utility. Batteries do, however, contribute to better system operation. DOE

N83-28712# Pacific Northwest Lab., Richland, Wash.
THERMODYNAMIC ANALYSIS OF FIVE COMPRESSED-AIR ENERGY-STORAGE CYCLES
J. A. Fort Mar. 1983 50 p refs
(Contract DE-AC06-76RL-01830)
(DE83-009470; PNL-4639) Avail: NTIS HC A03/MF A01

One important aspect of the compressed air energy storage (CAES) program is the evaluation of alternative CAES plant designs. The thermodynamic performance of the various configurations is critical to the successful demonstration of CAES as an economically feasible energy storage option. A computer code, the compressed air energy storage cycle analysis program (CAESCAP), was developed. This code was designed to calculate overall thermodynamic performance of proposed CAES system configurations. The results of applying this code to the analysis of five CAES plant designs are presented. The designs analyzed are conventional CAES; adiabatic CAES; hybrid CAES; pressurized fluidized bed CAES; and direct coupled steam CAES. Data were used to diagram the availability and energy flow for each of the five cycles. The resulting diagrams graphically illustrate the overall thermodynamic performance inherent in each plant configuration, and enable a more accurate and complete understanding of each design. DOE

N83-28713# Institute of Gas Technology, Chicago, Ill.
ELECTROLYTE VAPORIZATION LOSSES FROM MOLTEN-CARBONATE FUEL CELLS
Estela T. Ong and Terry D. Claar 1982 28 p refs Presented at the Spring Meeting of the Electrochem. Soc., Montreal, 9-14 May 1982

(Contracts DE-AC02-78ET-11276; DE-AC02-80ET-17019)
(DE83-009382; CONF-820508-7) Avail: NTIS HC A03/MF A01

Electrolyte loss by vaporizing was identified as a significant performance degradation mechanism in molten carbonate fuel cells. The continuous nature of electrolyte vaporization leads to development of tile porosity, which results in increased cell resistance, gas crossover, and loss of structural integrity. Electrolyte losses from fuel are reviewed and out of cell measurements of vapor loss from carbonate melts performed at IGT are presented. These out of cell vapor losses are compared with vaporization losses determined from fuel cells operated for 10,000 hours. DOE

N83-28714# New Mexico State Univ., Las Cruces.
NEW MEXICO STATE ENERGY RESEARCH AND DEVELOPMENT PROGRAM CONTRIBUTION TO LOVINGTON 100-KILOWATT PHOTOVOLTAIC PROJECT Final Report
V. Vernon Risser Jun. 1982 20 p
(DE82-905248; NP-2905248) Avail: NTIS HC A02/MF A01

In 1977 the New Mexico State Energy Research and Development (R & D) Program provided $25,000 to the New Mexico Solar Energy Institute to be used in conjunction with US Department of Energy (DOE) funding for design, engineering, and installation of a proposed 150-kilowatt peak photovoltaic (PV) system in Lovington, New Mexico. An additional $75,000 was also committed contingent on award of a contract for construction, test, and evaluation of the system. This award was made in 1979 and the PV system was completed in 1981. Even though budget constraints dictated reduction of the plant size to 100-kilowatts peak, this system has produced more energy than any other flat-plate PV system in the world. The utilization of the R & D Program funding in contributing to the success of this important New Mexico energy project is detailed. DOE

N83-28715# Los Alamos Scientific Lab., N. Mex.
A PASSIVE-SOLAR DESIGN MANUAL FOR THE UNITED STATES NAVY
W. O. Wray, F. A. Biehl, C. E. Kosiewicz, C. E. Miles, and E. R. Durlak 1982 7 p refs Presented at the 7th Natl. Passive Solar Conf., Knoxville, Tenn., 29 Aug. - 3 Sep. 1982
(Contract W-7405-eng-36)
(DE82-015801; LA-UR-82-1497; CONF-820819-1) Avail: NTIS HC A02/MF A01

A passive solar design manual for single-family detached residences and dormitory-type buildings is developed. The design procedure employed in the manual is a simplification of the original monthly solar load ratio (SLR) method. The new SLR correlations involve a single constant for each system. The correlation constant appears as a scale factor permitting the use of a universal performance curve for all passive systems. Furthermore, by providing location-dependent correlations between the annual solar heating fraction (SHF) and the minimum monthly SHF, the need to perform an SLR calculation for each month of the heating season is eliminated. DOE

N83-28716# Drexel Univ., Philadelphia, Pa. Dept. of Electrical and Computer Engineering.
A FILTERING ALGORITHM FOR ESTIMATING THE FLUID TEMPERATURES IN SOLAR COLLECTORS UNDER FLOW AND STAGNANT CONDITIONS
M. Sugisaka (Oita Univ., Japan), P. Kalata, and R. Fischl 1982 15 p refs Presented at the IFAC Conf. on Identification and System Parameter Estimation, Washington, D.C., 7 Jan. 1982
(Contracts DE-AS02-77CS-34512; DE-AS03-86CS-30218)
(DE82-017091; CONF-820151-1) Avail: NTIS HC A02/MF A01

A filtering technique is presented for estimating the fluid temperature profile in a solar energy collector modeled by a bilinear distributed-parameter system (the Klein plug-flow model). The filter minimizes the mean-square error between the actual measurements and the states predicted by the model when the fluid flow through the collector is controlled by an on-off pump (bang-bang control). The derivation of the filter algorithm uses invariant imbedding and the method of characteristics. This approach allows one to estimate under bang-bang control situations and has the flexibility to easily vary the sensor locations. As examples, the filtering process is applied to a simulated solar collector system with a variety number of sensors and many on-off fluid flow control cycles. DOE

N83-28717# Los Alamos Scientific Lab., N. Mex.
AN EXPERIMENTAL AND THEORETICAL STUDY OF SALT-GRADIENT POND INTERFACE BEHAVIOR
K. A. Meyer, D. P. Grimmer, and G. F. Jones 1982 7 p refs Presented at the Am. Sect. of the Intern. Solar Energy Conf., Houston, Tex., 1 Jun. 1982 Submitted for publication
(Contract W-7405-eng-36)
(DE82-012145; LA-UR-82-834; CONF-820629-4) Avail: NTIS HC A02/MF A01

An extension is described of a numerical model to include the effect of wind shear on upper convective region growth. Laboratory experiments designed to investigate interface motion in salt gradient ponds are reported, and the numerical model prediction is compared with an experimental result. Numerical model treatment of the double diffusive effects at the interfaces between convecting and nonconvecting regions in solar ponds is reviewed, and an approach is described that incorporates wind-generated turbulent entrainment into the interface treatment. The calculated behavior agrees with observations made on a solar pond. Two kinds of interface experiments are discussed. The first kind consists of tank experiments designed to give information on interface motion, and on salt and heat transport across interfaces. Numerical model predictions are compared with experimental data. DOE

N83-28718# Department of Energy, Washington, D. C. Div. of Geothermal Energy.
GEOTHERMAL MONITOR REPORT Progress Report
Jun. 1982 95 p
(DE82-013757; DOE/CE-0009/6; PR-6) Avail: NTIS HC A05/MF A01

Geothermal Progress Monitor Report No. 6 presents a state-by-state summary of the status of geothermal leasing, exploration, and development in major physiographic regions where geothermal resource potential has been identified. Recent state-specific activities are reported at the end of each state status report, while recent activities of a more general nature are summarized briefly in Part 2 of the report. A list of recent publications of potential interest to the geothermal community and a directory of contributors to the geothermal progress monitoring system are also included. DOE

N83-28719# New Mexico State Univ., Las Cruces. Dept. of Mechanical Engineering.
HYDROTREATING OF COAL LIQUIDS, PHASE 2 Final Report
Donald B. Wilson and James M. Bogdanor Jun. 1982 134 p refs
(DE82-905315; NP-2905315) Avail: NTIS HC A07/MF A01

The kinetic parameters for the pseudo first-order denitrogenation and desulfurization of an SASOL coal naphtha was studied. Only the fraction boiling over 95 C (at 25.8 mmHg) was hydrotreated due to the high volatility of the whole naphtha. Dodecane was used as a diluent to further reduce the volatility of the hydrotreated naphtha bottoms. A commercial Ni-Mo catalyst (HDS9A) was employed. Based on chromatographic results, nitrogen and sulfur were successfully removed from the naphtha bottoms. The mathematical model developed to describe the pseudo first-order denitrogenation and desulfurization of the naphtha bottoms in the semi-batch, slurry reactor was adequate to explain the experimental results. DOE

N83-28720# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.
REVERSIBLE CHEMICAL REACTIONS FOR ENERGY STORAGE IN A LARGE-SCALE HEAT UTILITY
R. G. Nix, P. W. Bergeron, and R. E. West (Colorado Univ.) May 1982 7 p refs Presented at the 17th Intersoc. Energy Conversion Eng. Conf., Los Angeles, 8 Aug. 1982
(Contract DE-AC02-77CH-00178)

(DE82-015234; SERI/TP-234-1543; CONF-820814-7) Avail: NTIS HC A02/MF A01

The feasibility of using either Ca(OH)2 or CH2-CO2 reaction systems for long duration storage in a central receiver, solar energy facility was studied. The system is required to generate 262 MW/sub t/ (895 million Btu/h) as 4.14-MPa (600 psig), 400 C (750 F) superheated steam, with usage split evenly among 10 users clustered in an industrial park. Results indicate that use of a solar thermal system with long duration storage of either thermochemical or direct thermal energy (molten draw salt) is probably not justified when compared to the use of coal fired boilers for steam generation. However, solar thermal systems with either thermochemical or direct thermal energy storage may be competitive with oil or natural gas fired boilers if the cost of the solar energy supplied to the storage system is sufficiently low and the costs of oil and natural gas have escalated to a sufficiently high level. DOE

N83-28721# New Mexico State Univ., Las Cruces. Dept. of Chemistry.

SOLAR SYNTHETIC FUEL PRODUCTION: HYDROGEN FROM THE SUN Final Report, 1 Jul. 1980 - 31 Aug. 1981

Dennis D. Davis Jun. 1982 36 p refs Sponsored by New Mexico Energy Research and Development Inst.

(DE82-017561; NP-2017561) Avail: NTIS HC A03/MF A01

The investigation of the photo-induced electron transfer reactions of polymeric absorbers has shown that several stringent requirements exist for selection of an appropriate back bone polymer. Poly(vinylpyridine), the first of those polymers to be evaluated, does not allow for high degrees of substitution of absorbing centers onto the back-bone, and those that do attach, are both thermally and photochemically labile. A program of synthesis has resulted in several new polymers which have failed to meet the solubility requirement. This synthetic effort is still in force and will operate for the next several years. Concomitantly, the investigation of the electron transfer properties of smaller subunits is proceeding and will eventually mesh with the synthesis program. DOE

N83-28722# Los Alamos Scientific Lab., N. Mex.

MONITORED PASSIVE-SOLAR BUILDINGS

R. W. Jones, comp. Jun. 1982 69 p refs

(Contract W-7405-eng-36)

(DE82-019715; LA-9098-MS) Avail: NTIS HC A04/MF A01

Selected performance results from six monitored passive and hybrid solar heated buildings are presented. These employ: a two story trombe wall; a thermosyphoning solar air heater with rock bin storage; a greenhouse; a composite concrete and water trombe wall; two story sunspace; and, for a mobile/modular home, direct gain and roof pond. DOE

N83-28723# Los Alamos Scientific Lab., N. Mex.

SOLAR HEATING IN THE LOS ALAMOS MOBILE/MODULAR HOME UNIT NO. 1

J. C. Hedstrom and S. W. Moore Apr. 1982 66 p refs

(Contract W-7405-eng-36)

(DE82-016136; LA-9299-MS) Avail: NTIS HC A04/MF A01

Mobile/Modular Home Unit No. 1 National Laboratory has an active system that incorporates 340 sq ft of flat black, single glazed, flat plate air heating collectors mounted at a 60 tilt on the south wall. The thermal storage is in 1536 pint jars of water. Data acquisition was accomplished with a Hewlett-Packard (HP) 3050 system controlled with a HP 9825 desk top calculator. The solar energy system has provided about 70% of the heating requirements of the house each season. Although the active solar energy system provides a major fraction of the space and domestic hot water requirements, the yearly total energy supplied is low. This is primarily because the house load is lower than expected because of passive gains and internal heat generation. Low performance is also the result of a low storage mass and several possible uncontrolled air leaks. DOE

N83-28724# California Univ., Berkeley. Lawrence Berkeley Lab.

MONITORED SUPERINSULATION AND SOLAR HOUSES IN NORTH AMERICA: A COMPILATION AND ECONOMIC ANALYSIS

J. C. Ribot, J. G. Ingersoll, and A. H. Rosenfeld Jun. 1982 7 p refs Presented at 7th Natl. Passive Solar Conf., Knoxville, Tenn., 29 Aug. 1982

(Contract DE-AC03-76SF-00098)

(DE82-018782; LBL-14576; CONF-820819-12) Avail: NTIS HC A02/MF A01

In ongoing compilation, BECA-A (Building Energy-Use Compilation and Analysis, Part A, New Homes) 97 submetered, energy-efficient homes in North America and Europe have been analyzed. Only 21 have acceptable data on added first cost of conservation measures. Of these, the lowest cost of conserved energy d$/dE is for the superinsulated category, where d$/dE is about $7/MBtu. Only 22 homes have submetering adequate to permit correcting space heating loads for variations in occupant behavior (thermostat preference and heat gains from appliances). For these 22, the standardized fuel intensity is only 67 kJ/sq m-DD, compared to US 1979 building practice of 140, or US stock of 260. DOE

N83-28725# California Univ., Berkeley. Lawrence Berkeley Lab.

ENGINEERING ANALYSIS OF AN NH3-AIR ALKALINE FUEL CELL SYSTEM FOR VEHICULAR APPLICATIONS

P. N. Ross, Jr. Jun. 1982 25 p refs Presented at Workshop on Renewable Fuels and Advan. Power Sources for Transport., Denver, 17 Jun. 1982

(Contract DE82-018517)

(DE82-018517; LBL-14578; CONF-820686) Avail: NTIS HC A02/MF A01

The use of a hydrogen air alkaline fuel cell in a vehicle with liquid anhydrous ammonia as the hydrogen storage medium was examined. In the system analyzed here, hydrogen is supplied to the fuel cell by the catalytic cracking of liquid anhydrous ammonia, making the total system an indirect NH3 air fuel cell system. It was found that the endothermicity of the NH3 cracking reaction is supplied by combustion of the anode vent gas after utilizing 80% of the hydrogen electrochemically resulting in a minimal efficiency penalty. Laboratory scale examinations were made of the ammonia cracking reaction and the power characteristics of an alkaline fuel cell running on cracked ammonia and air. Single cell and bicell testing indicated system thermal efficiencies of 48 to 60% (based on L.H.V. of NH3) can be achieved at power densities of 1 to 2.6 kW/sq m using currently known electrode technology in a bipolar design. DOE

N83-28726# Oak Ridge Gaseous Diffusion Plant, Tenn.

LARGE CLIMATE-MODERATING ENVELOPES FOR ENCLOSED STRUCTURES: A PRELIMINARY EVALUATION OF ENERGY-CONSERVATION POTENTIAL

G. E. Giles, J. E. Park, and R. L. Wendt 1982 23 p refs Presented at AIAA/ASME Joint Conf. on Fluids, Plasma, Thermophys. and Heat Transfer, St. Louis, 7 Jun. 1982

(Contract W-7405-eng-26)

(DE82-002943; K/CSD/INF-81/21) Avail: NTIS HC A02/MF A01

A preliminary estimate of the energy conservation benefits of a large climate-moderating envelope (LCME) is given. A hypothetical LCME design was chosen and a coupled fluid dynamic and energy transport analysis was performed to estimate the energy conservation potential of this design. The heat transfer models included insolation, outside air temperature and wind, thermal radiation exchange with the sky and between the fabric and ground, and thermal storage in the earth mass beneath the LCME. The energy transported within the fluid by the buoyancy-driven circulation was modeled as an incompressible fluid utilizing the Boussinesq approximation. The climatic conditions were assumed to vary in smooth, repeating daily cycles. The numerical simulation of climatic variation was continued until the results within the LCME achieved a repeating daily cycle. DOE

N83-28727# Institute of Gas Technology, Chicago, Ill.

FUELS AND CHEMICALS FROM BIOMASS: DEPOLARIZED WATER ELECTROLYSIS Biannual Progress Report, 28 Sep.

1981 - 31 Mar. 1982
M. R. StJohn, A. F. Sammells, and A. J. Furgala May 1982 77 p refs
(Contract DE-AC02-81CE-90032)
(DE82-015523; DOE/CE-90032/06) Avail: NTIS HC A05/MF A01

Biomass derivable materials investigated electrochemically included glucose, glucose derivatives, and lignosulfonic acid, with emphasis placed on glucose. Glucose was surveyed for evidence of electro-oxidation by cyclic voltammetry on shiny plantinum, platinized platinum, rhodium, lead, and vitreous carbon. The electrochemical oxidation of glucose on the metal oxide anode materials, ruthenized titanium and lead ruthenate, was surveyed by recording steady state current potential curves because cyclic voltammograms recorded with these anode materials exhibited large residual currents. Each anode material was investigated for glucose electro-oxidative activity in electrolytes covering a pH range of 0.3 to 14.8. Electrochemical oxidation of the prototype carbohydrate, glucose, occurred at potentials more negative than oxygen evolution over a wide variety of experimental conditions. DOE

N83-28728# Lincoln Lab., Mass. Inst. of Tech., Lexington.
DATA REPORT FOR THE NORTHEAST RESIDENTIAL EXPERIMENT STATION, FEBRUARY 1982
M. C. Russell, P. Raghuraman, and P. C. Mahoney Jun. 1982 19 p refs
(Contract DE-AC02-76ET-20279)
(DE82-019336; DOE/ET-20279/206) Avail: NTIS HC A02/MF A01

Physical performance data obtained from photovoltaic energy systems under test are tabulated. Five prototype residential photovoltaic systems are under test, each of which consist of a roof mounted photovoltaic array sized to meet at least 50% of the annual electrical demand of an energy conserving house, and an enclosed structure to house the remainder of the photovoltaic system equipment, test instrumentation, and work space. In addition, one full sized photovoltaic residence, is also being monitored. A monthly summary presents a tabulation summarizing the monthly performance of the photovoltaic systems and monitored houses, as well as meteorological data. Then, an hour by hour tabulation of information is given for an average day of the month, including monitored house and prototype systems data. DOE

N83-28729# Council of American Building Officials, Falls Church, Va.
HOME STUDY GUIDE FOR USE WITH THE MANUAL FOR SOLAR SPECIALISTS
Jul. 1982 148 p
(Contract DE-AC01-78CS-34281)
(DE82-019400; DOE/CS-34281/2) Avail: NTIS HC A07/MF A01

The manual for solar specialists is presented. Each lesson in each unit of the study guide gives goals and objectives references, and exercises. For each unit a test over the material is given. Fundamentals of solar radiation, passive and active solar systems, hybrid systems, and code provisions are covered. Terms important to each unit are listed. DOE

N83-28730# Arizona Univ., Tucson. Bureau of Geology and Mineral Technology.
GEOTHERMAL ENERGY IN ARIZONA Final Report
Claudia Stone and James C. Witcher Sep. 1982 415 p refs
(Contract DE-FC07-79ID-12009)
(DE83-009343; DOE/ID-12009/T4) Avail: NTIS HC A18/MF A01

Current knowledge and basic data on geothermal resources in Arizona were compiled. The following are covered: specific area investigations, thermal aspects of Arizona, and exploration methods. DOE

N83-28731# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
PERFORMANCE CHARACTERISTICS OF AN ELECTRIC-VEHICLE LEAD-ACID BATTERY PACK AT ELEVATED TEMPERATURES
P. Chapman 1 Apr. 1982 42 p refs Sponsored by NASA
(Contract DE-AI01-78CS-54209)
(NASA-CR-170362; JPL-Pub-82-25; JPL-5030-540; NAS 1.26:170362; DE82-013327; DOE/CS-54209/8) Avail: NTIS HC A03/MF A01 CSCL 10B

Data are presented for discharge testing of an 18-Exide IV electric car battery pack over initial electrolyte temperature variations between 27 and 55 C. The tests were conducted under laboratory conditions and then compared to detailed electric vehicle simulation models. Results showed that battery discharge capacity increased with temperature for constant current discharges, and that battery energy capacity increased with temperature for constant power discharges. Dynamometer test of the GE Electric Test Vehicle showed an increase in range of 25% for the highest electrolyte temperature. DOE

N83-28732# Reinke (Ralph G.), Wausau, Wis.
DISTILLING ALCOHOL WITH WASTE AUTOMOBILE HEAT Final Report
Ralph Reinke 30 Jun. 1982 11 p
(Contract DE-FG02-81AF-92017)
(DE82-018821; DOE/AF-92017/T3) Avail: NTIS HC A02/MF A01

The distillation unit to be cost effective would have to be fabricated and installed by a skilled but free labor do-it-yourselfer or hobbyist. A manufacturer would not risk a large production run to reduce fabrication cost because of the operational problems which make the end result marginal. Similarly the variations of the automobiles would require custom fitting the unit to the car. The operational methods including permits and EPA rules seriously restrict this type operation for anything other than experiments and as a hobby. An acute shortage of fuel would have to take place where availability takes precedence over cost and convenience before the production of the unit would be worth investing. Drawings, fabrication instructions and parts lists are included. DOE

N83-28733# Rockwell International Corp., Canoga Park, Calif. Energy Systems Group.
GEOTHERMAL DISTRICT HEATING SYSTEMS
George S. Budney and Frank Childs (Edgerton, Germeshausen and Grier, Inc., Idaho Falls, Idaho) 1982 30 p Presented at the Inter. District Heating Assoc. Conf., Beaupre, Quebec, 14-16 Jun. 1982
(Contract DE-AC07-76ID-01570)
(DE82-018838; EGG-M-10682; CONF-820693-1) Avail: NTIS HC A03/MF A01

Ten district heating demonstration projects and their present status are described. The projects are Klamath County YMCA, Susanville District Heating, Klamath Falls District Heating, Reno Salem Plaza Condominium, El Centro Community Center Heating/Cooling, Haakon School and Business District Heating, St. Mary's Hospital, Diamond Ring Ranch, Pagosa Springs District Heating, and Boise District Heating. DOE

N83-28734# Edgerton, Germeshausen and Grier, Inc., Idaho Falls, Idaho.
RAFT RIVER 5MW POWER PLANT: A SMALL BINARY POWER PLANT
J. F. Whitbeck, E. G. DiBello, and L. F. Walrath 1982 11 p Presented at the Geothermal Resources Council Meeting, Long Beach, Calif., 13 Jun. 1982
(Contract DE-AC07-76ID-01570)
(DE82-018992; EGG-M-12482; CONF-820690-1) Avail: NTIS HC A02/MF A01

The Raft River 5MW power plant is a binary cycle pilot plant. The system uses isobutane in a dual boiling cycle. This cycle was selected because the well field and temperatures were not well known at the time of cycle selection, and therefore, a boiling cycle was desirable. The dual boiling features provides about 15 to 20% more power and makes the output less sensitive to changes in geothermal temperature changes than a single boiler system.

The plant design was based upon a 290F geothermal fluid temperature at the inlet to the plant and has a gross nominal generator rating of 5MW; however, actual output will vary according to ambient wet bulb temperatures over a range from 4.4MW to 6.2MW with the actual plant inlet temperature of 278F being obtained. The plant is supplied by three production wells. Geothermal fluid boost pumps within the plant inlet provide the pressure necessary to overcome plant pressure drop and return the fluid to the two injection sites. DOE

N83-28735# Aerospace Corp., El Segundo, Calif. Energy and Resources Div.
POSSIBLE APPLICATION OF SOLAR-THERMAL ENERGY IN THE CHEMICAL INDUSTRY
L. R. Martin Jun. 1982 29 p refs
(Contracts DE-AI03-81SF-11578; F04701-81-C-0082)
(DE82-019218; DOE/SF-11578/T1; ATR-82(2835)-ND) Avail: NTIS HC A03/MF A01

Eight chemicals are identified that require substantial amounts of nonrecoverable energy for their production. The chemicals are: ethylene, vinyl chloride, styrene, propylene, butadiene, isoprene, hydrogen, and phosphorus. These chemicals are used to produce a wealth of products such as plastics, rubbers and fertilizers. In most cases, these energy intensive materials are at the top of a pyramid of subsequent, exothermic reactions and products that do not require additional thermal energy except for separation processes. Their production at present is centralized and done on a large scale, and most of the organics are produced in refineries where hydrocarbon energy is abundant. This association with refineries means at present that direct substitution of solar energy for hydrocarbon fired heaters may not be convenient, even though scientifically feasible. Other solar energy applications are production of caustic soda from thermodynamic cycles, ethylene from ethanol, and butadiene from ethanol. DOE

N83-28736# Brookhaven National Lab., Upton, N. Y. Dept. of Chemistry.
SOLAR ENERGY STORAGE BASED ON METAL COMPLEXES
Norman Sutin 1982 14 p refs Presented at the US-Japan Seminar on Solar Energy Coversion, Honolulu, Haw., 22 Mar. 1982
(Contract DE-AC02-76CH-00016)
(DE82-015246; BNL-31232; CONF-820370-1) Avail: NTIS HC A02/MF A01

Some systems based on the use of metal complexes to mediate the homogeneous photodecomposition of water into hydrogen and oxygen are described. Tris(bipyridine)ruthenium(II) as the photosensitizer is emphasized. The excited states of a number of other mononuclear, binuclear, and polynumclear complexes are summarized. It is noted that the excited-state lifetimes range from milliseconds to nanoseconds, that some of the excited states are good reductants while others are good oxidants and that, except for the M/sup +/ +e- = /sup */M (1), M/sup */ + e- = M- (2), /sup *Fe(bpy)s/sup 2+/-Fe(bpy)3/sup 3 + / couple, the ground and excited state couples generally undergo very rapid electron exchange reactions. DOE

N83-28737# Lincoln Lab., Mass. Inst. of Tech., Lexington.
PHOTOVOLTAIC-SYSTEM EVALUATION AT THE NORTHEAST RESIDENTIAL EXPERIMENT STATION Final Report, Nov. 1980 - May 1982
Miles C. Russell Jan. 1983 163 p refs
(Contract DE-AC02-76ET-20279)
(DE83-008259; DOE/ET-20279/219) Avail: NTIS HC A08/MF A01

Five residential photovoltaic systems were tested and the systems' performance and cost was evaluated. The five systems each consist of an unoccupied structure employing a roof mounted photovoltaic array and a utility connected power inverter capable of sending excess PV generated energy to the local utility system. The photovoltaic systems are designed to meet at least 50% of the total annual electrical demand of residences in the cold climate regions of the country. The following specific issues were investigated: photovoltaic array and inverter system power rating and performance characterization, system energy production, reliability and system cost/worth. Summary load data from five houses in the vicinity of the Northeast Residential Experiment Station, and meteorological data from the station's weather station are also presented. DOE

N83-28738# Budd Co., Fort Washington, Pa. Technical Center.
DEVELOPMENT AND FABRICATION OF SOLAR-COLLECTOR SMC REFLECTOR ASSEMBLIES
Paul A. Kirsch Dec. 1982 46 p refs
(Contract DE-AC04-76DP-00789)
(DE83-008308; SAND-82-7109) Avail: NTIS HC A03/MF A01

A parabolic trough solar collector array consisting of four each 2 x 6 m reflector modules was produced. Each module requires a structural torque tube on which are mounted six 1 x 2 m molded sheet molding compound (SMC)/glass panels. The fabrication, assembly, and inspection procedures for production of SMC reflector panels and assemblies are established. DOE

N83-28739# Acurex Corp., Mountain View, Calif.
NOVEL APPROACHES FOR LOW-COST PHOTOVOLTAIC CONCENTRATORS Final Report, Jan. 1978 - Jul. 1980
T. Mulier and R. Maraschin Nov. 1982 162 p
(Contract DE-AC04-76DP-00789)
(DE83-010297; SAND-82-7125) Avail: NTIS HC A08/MF A01

The feasibility of producing a low cost photovoltaic concentrator that uses sealed beam headlight technology was investigated. The photovoltaic cell is placed at the focus of the headlamp reflector. A prototype 60 W array was built. The array efficiency was approximately 6%. DOE

N83-28740# Argonne National Lab., Ill.
SOLAR LIQUID-METAL MHD PERFORMANCE PREDICTIONS
H. K. Geyer and E. S. Pierson 1982 6 p refs Presented at the 20th Symp. on the Eng. Aspects of MHD, Irvine, Calif., 14 Aug. 1982
(Contract W-31-109-eng-38)
(DE83-007865; CONF-8208116-1) Avail: NTIS HC A02/MF A01

Previous liquid-metal MHD (LMMHD) solar studies demonstrated attractive performance based on component parameters characteristic of mature systems. Near term applications, i.e., conservative component parameters and lower temperatures were studied. Efficiencies are calculated for LMMHD Rankine cycles at 420 to 470 K, and LMMHD Brayton cycles at 700 to 810 K. It appears that efficiencies are competitive with alternative energy conversion concepts. DOE

N83-28741# Arizona State Univ., Tempe. College of Engineering and Applied Sciences.
CONVERSION OF CELLULOSIC WASTES TO LIQUID FUELS Interim Report
James L. Kuester Aug. 1982 118 p refs
(Contract DE-AC02-76CS-40202)
(DE83-007978; DOE/CS-40202/T6) Avail: NTIS HC A06/MF A01

The conversion of various cellulosic materials to quality liquid hydrocarbon transportation fuels is described. Projected liquid hydrocarbon yields of 30 to 40 gals/ton of cellulosic feedstock (dry, ash free) for synthesis gas compositions corresponding to that obtainable for average feedstocks and using relatively inexpensive cobalt/alumina type impregnated catalysts were achieved. The utility of using dolomite to adjust the H2/CO pyrolysis gas ratio was demonstrated. An iron liquefaction catalyst study confirmed the detriment of olefins in the feedgas for these type of catalysts. Two completely new fluidized bed reactor systems were designed and installed to accommodate the liquefaction catalyst development work. DOE

N83-28742# Brookhaven National Lab., Upton, N. Y. Process Sciences Div.
FLASH PYROLYSIS OF BIOMASS WITH REACTIVE AND NON-REACTIVE GASES Summary Report, Mar. 1982 - Mar. 1983

Meyer Steinberg, Peter T. Fallon, and M. S. Sundaram Mar. 1983 25 p refs Presented at the 15th Biomass Thermochem. Conversion Contractors' Meeting, Atlanta, 16-17 Mar. 1983
(Contract DE-AC02-76CH-00016)
(DE83-010852; BNL-32746; CONF-830323-2) Avail: NTIS HC A02/MF A01

The process chemistry of the flash pyrolysis of biomass (wood) with the reactive gases, H2 and CH4 and with the nonreactive gas He was determined in a 1 in. downflow tubular reactor. It is found that with hydrogen, flash hydropyrolysis leads to high yields of methane and CO which can be used for SNG and methanol production. With methane, flash methanolysis of wood, leads to high yields of ethylene, benzene and CO which can be used for the production of valuable feedstocks and methanol fuel. At reactor conditions of 50 psi and 10,000 C and approximately 1 sec residence time, the ethylene yield based on wood carbon converted is 22%, benzene 12% and the CO yield is 48%. The yield of ethylene is 2.2 times higher with methane than with helium, which indicates a free radical reaction between CH4 and the pyrolyzed wood. A preliminary process analysis indicates an economically competitive process for the production of ethylene, benzene and ethanol based on the methanolysis of wood. The development of the data base for the flash pyrolysis of wood and other biomass materials with methane and other reactive gases and the determination of the role of the hemicellulose and lignin in the formation of these valuable fuels and feedstocks are recommended. DOE

N83-28743# International Inst. for Applied Systems Analysis, Laxenburg (Austria). Energy Systems Group.
THE FUTURE UTILIZATION OF SOLAR ENERGY IN A WESTERN EUROPEAN CONTEXT, PART 1 Final Report, Jun. 1981
Nebojsa Nakicenovic and Sabine Messner Bonn Bundesministerium fuer Forschung und Technologie Feb. 1983 291 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie 2 Vol.
(BMFT-FB-T-83-001-Pt-1; ISSN-0340-7608) Avail: NTIS HC A13/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 45,50

Three scenarios specifying possible but not necessarily likely transitions to a reliable energy system for Western Europe were considered. The scenarios are based on dynamic balances of energy demand and supply using detailed models to achieve consistency. Two scenarios consider exclusively solar energy, one based on centralized solar technologies (hard scenario) and the other on decentralized, user-oriented technologies (soft scenario). The third scenario, based on nuclear technologies, incorporates an intermediate degree of centralization in the energy system and serves as a comparison to the two exclusively solar scenarios. All three scenarios lead to reliable energy futures before the year 2100, which is the time horizon of the study. While all three scenarios eliminate Western Europe's dependence on domestic and foreign fossil energy sources, the hard solar scenario requires substantial imports of solar produced hydrogen. Author (ESA)

N83-28744# International Inst. for Applied Systems Analysis, Laxenburg (Austria). Energy Systems Group.
THE FUTURE UTILIZATION OF SOLAR ENERGY IN A WESTERN EUROPEAN CONTEXT, PART 2 Final Report, Jun. 1981
Nebojsa Nakicenovic and Sabine Messner Bonn Bundesministerium fuer Forschung und Technologie Feb. 1983 27 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie 2 Vol.
(BMFT-FB-T-83-002-Pt-2; ISSN-0340-7608) Avail: NTIS HC A03/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 5,50

Three scenarios specifying possible but not necessarily likely transitions to a reliable energy system for Western Europe were considered. The scenarios are based on dynamic balances of energy demand and supply using detailed models to achieve consistency. Two scenarios consider exclusively solar energy, one based on centralized solar technologies (hard scenario) and the other on decentralized, user-oriented technologies (soft scenario). The third scenario, based on nuclear technologies, incorporates an intermediate degree of centralization in the energy system and serves as a comparison to the two exclusively solar scenarios. All three scenarios lead to reliable energy futures before the year 2100. While all three scenarios eliminate Western Europe's dependence on domestic and foreign fossil energy sources, the hard solar scenario requires substantial imports of solar produced hydrogen. Author (ESA)

N83-28745# Brown, Boveri und Cie, A.G., Heidelberg (West Germany). Zentrales Forschunglabor.
ABSORPTION HEAT PUMP FOR HEATING OF SMALL RESIDENTIAL BUILDINGS Final Report, May 1981
Hermann Birnbreier, Jochen Jessinghaus, Karl-Ludwig Sauer, and Botho Ziegenbein Bonn Bundesministerium fuer Forschung und Technologie Feb. 1983 131 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-83-011; ISSN-0340-7608) Avail: NTIS HC A08/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 27,50

A methanol/lithium bromide+zinc bromide absorption heat pump for heating one-and two-family residential buildings was developed. Thermodynamic data of the ternary mixtures with a molar ratio LiBr/ZnBr = 2:1 and 4:1 were obtained. A prototype unit (heating capacity: 10 kW) was built and tested under all conditions occurring in a real heating system. For application in indirectly fired absorption heat pumps (generator temperature < 100 C) a 4:1 mixture is favored. Due to an excellent partial load behavior, the seasonal heat transfer factor is as high as 1.56. The stability of stainless steel and copper in ternary solution mixtures is sufficient. Author (ESA)

N83-28746# Dornier-Werke G.m.b.H., Friedrichshafen (West Germany). Neue Technologien-Forschung.
POSSIBILITIES OF INCREASED ENERGETIC USE OF PHOTOCHEMICAL, PHOTOELECTROCHEMICAL AND BIOLOGICAL METHODS OF SOLAR ENERGY CONVERSION Final Report, Feb. 1982
Eilert Hamer, Helmuth Moehwald, Bernt Obkircher, Wolfgang Schaefer, and Bernhard Schroeder Bonn Bundesministerium fuer Forschung und Technologie Mar. 1983 333 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-83-036; ISSN-0340-7608) Avail: NTIS HC A15/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 50

Methods of photochemical, photoelectrochemical and biological solar energy conversion were elaborated for economical use in a far future. Present status and possibilities of development; physical and technical limitations; and cost of use in possible applications are discussed. The most promising method is the photoelectrochemical generation of electricity. Cases in which the production of biomass and the production of methanol by solar energy are feasible are outlined. The other methods, including those producing hydrogen by means of sunlight, cannot be used economically in regions of temperate climate. Author (ESA)

N83-28747# Resource Transitions, Inc., Santa Cruz, Calif.
A CITIZENS' PLAN FOR ENERGY SELF-RELIANCE. THE PROCESS REPORT: HOW IT HAPPENED
J. Cohn and R. Stayton 1982 16 p refs
(PB83-136986; NSF/OSS-82005) Avail: NTIS HC A02/MF A01 CSCL 10A

Results are presented of a project undertaken to demonstrate that local action could meet the energy crisis in Santa Cruz, California, and to demonstrate that a community could cooperatively develop an energy plan for greater energy self reliance. Community participation took several forms: neighborhood outreach; community education and involvement, and media and press coverage of the project. An advisory board was formed and research was undertaken to determine the feasibility of energy ideas generated in the neighborhoods and to answer questions posed by the advisory board. Selection criteria were developed for use in screening

individual actions. Thirty programs with more than 120 actions were approved and a list of 16 priorities was established. Actions implemented by the Advisory Board are noted. Author (GRA)

N83-28748# Economic Research Service, Washington, D. C. National Economics Div.
PHOTOVOLTAICS: TECHNOLOGICAL PROGRESS AND ITS FUTURE IN AGRICULTURE
Walter G. Heid, Jr. Nov. 1982 129 p refs
(PB83-147728; AGES-820707) Avail: NTIS HC A07/MF A01 CSCL 10B

Advances in photovoltaic technology are rapidly bringing it into the range of competitiveness with conventional and other alternative energy source. Photovoltaic systems can be used for nearly all of agriculture's stationary power needs, including energy to operate appliances and to heat farm homes. It is an appropriate technology for small as well as larger sized farms. As researchers and farmers weigh future alternative energy choices, photovoltaic systems should be included in their economic comparisons.
Author (GRA)

N83-28749# Texas A&M Univ., College Station. Dept. of Chemical Engineering.
METAL CHELATE CATALYSTS FOR FUEL CELLS Final Report, Jun. 1979 - Oct. 1982
Ron Darby, Masao Yamana, Hari Dhar, and Ralph White Oct. 1982 84 p refs Sponsored by Gas Research Inst.
(PB83-167270; GRI-82/0027) Avail: NTIS HC A05/MF A01 CSCL 10B

Various modified forms of several organometallic chelate compounds were synthesized and tested for their activity and stability as oxygen reduction electrocatalysts in sulfuric acid electrolyte. The most active catalysts found were cobalt tetraazaannulene (CoTAA), iron phthalocyanine (FePc) and cobalt tetraphenylporphyrin (CoTPP). However, these catalysts have limited stability in strong acids. Author (GRA)

45 ENVIRONMENT POLLUTION

Includes air, noise, thermal and water pollution; environment monitoring; and contamination control.

N83-28750 Dartmouth Coll., Hanover, N.H.
ALUMINUM MIGRATION AND CHEMICAL WEATHERING IN SUBALPINE AND ALPINE SOILS AND TILLS, MT. MOOSILAUKE, N.H.: THE EFFECTS OF ACID RAIN Ph.D. Thesis
Roderic Alan Parnell, Jr. 1982 313 p
Avail: Univ. Microfilms Order No. DA8218976

Aluminum mobilization in response to acidification by precipitation has been described by three methods: (1) observation of existing and relic soil weathering products, particularly clay minerals, (2) measurement of soil solution and low-order stream chemistry, and (3) quantification of the distribution, amount, and dissolution rate of labile soil aluminum. From the latter two methods, the amount and rate of aluminum leaching predicted. Six labile aluminum reservoirs exist, spanning a large range of solubilities. They are, in order of decreasing solubility: (1) inorganic and organic exchangeable aluminum, (2) organo-aluminum complexes, (3) amorphous aluminum trihydroxide, (4) hydroxy-aluminum interlayers in vermiculitic clay minerals, (5) clay mineral lattices and (6) primary aluminosilicates. Progressive acid dissolution (P.A.D.) analysis reveals that only the first four reservoirs yield significant amounts of soluble aluminum and have kinetically distinct solubilities. Dissert. Abstr.

N83-28751 California Univ., Davis.
THE EFFECT OF A 2-DIMENSIONAL OBSTACLE ON THE DISPERSION OF A HEAVIER-THAN-AIR GAS IN AN ATMOSPHERIC BOUNDARY LAYER Ph.D. Thesis
Steven Blair Sutton 1982 214 p
Avail: Univ. Microfilms Order No. DA8227896

The results of a combined numerical and experimental investigation of the effect of a two dimensional obstacle on the dispersion of a heavier-than-air gas in an atmospheric boundary layer are presented. In the numerical analysis portion, the governing equations are developed and the numerical solution algorithm is discussed. Fluid motion was governed by the two dimensional, incompressible Navier-Stokes equations and the equations for mass conservation. The two-equation Jones-Launder turbulence model was used to provide closure of the Reynolds stresses and fluxes. Curvature correction and pressure gradient models were incorporated in the turbulence equations. An implicit algorithm, employing the ADI technique of Peaceman and Rachford was used for the parabolic equations. The elliptic pressure equation was solved using a direct matrix solution method. In the experimental portion a rough wall boundary layer, that simulated an atmospheric surface layer flow, was generated in a 21.3 m long wind tunnel having a cross-section of 1.18 m x 1.68 m at the test section.
Dissert. Abstr.

N83-28752# Oak Ridge National Lab., Tenn.
NATURAL ACIDITY OF WATERS IN PODZOLIZED SOILS AND POTENTIAL IMPACTS FROM ACID PRECIPITATION
J. D. Stednick (Colorado St. Univ.) and D. W. Johnson 1982 11 p refs Presented at Intern. Symp. on Hydrometeorol., Denver, 13 Jun. 1982
(Contract W-7405-eng-26)
(DE82-017427; CONF-820678-1) Avail: NTIS HC A02/MF A01

Nutrient movements through sites in southeast Alaska and Washington were documented to determine net changes in chemical composition of precipitation water as it passed through a forest soil and became stream flow. These sites were not subject to acid precipitation, yet soil water was acidified to 4.2 by natural organic acid forming processes in the podzol soils. Organic acids precipitated in the subsoils, allowing a pH increase. Precipitation composition was dominated by calcium, magnesium, sodium, and chloride. Anionic constituents of the precipitation were dominated by bicarbonate at the Washington site. Soil podzolization processes concurrently increased solution color and iron concentrations in the litter and surface horizons leachates. The anion flux through the soil profile was dominated by chloride and sulfate at the southeast Alaska site, whereas at the Washington site anion flux appeared to be dominated by organic acids. Electroneutrality calculations indicated a cation deficit for the southeast Alaska site. DOE

N83-28753# Los Alamos Scientific Lab., N. Mex.
CLEAN AIR AND ENERGY: FROM CONFLICT TO RECONCILIATION
C. D. Kolstad, W. D. Schulze, and M. D. Williams (John Muir Inst. for Environmental Studies, Napa, Calif.) 1982 25 p refs Presented at Ann. Meeting of the Am. Assoc. for the Advan. of Sci., Washington, D.C., 3 Jan. 1982
(Contract W-7405-eng-36)
(DE82-014057; LA-UR-82-1190; CONF-820118-7) Avail: NTIS HC A02/MF A01

Unconstrained energy resource development in the Rocky Mountain west is likely to threaten the environment and the health and well-being of the people. Impacts may be associated with visibility degradation, toxic concentrations of gases, and deposition of acidic or toxic substances. Because the possible benefits of energy development in the region are very large, there is great concern that constraints imposed by air quality regulation may preclude the use of important resources or make unduly expensive energy produced from the region. The conflict between energy and clean air in the region is exacerbated by non-energy sources, such as copper smelters and urban areas, that already pose significant environmental threats. The hard policy question is not how to preserve clean air resources or how to develop energy but how to achieve and balance both goals. The effects and regulatory costs and benefits of air pollution control are discussed, and policy directions to protect air quality while pursuing energy development are presented. DOE

N83-28754# Alaska Univ., Fairbanks.
SOURCES AND SINKS OF CARBON DIOXIDE IN THE ARCTIC REGIONS
T. A. Gosink and J. J. Kelley 1982 37 p refs
(Contract DE-AT06-80EV-10429)
(DE82-013682; DOE/EV-10429/6) Avail: NTIS HC A03/MF A01

The data base required to adequately ascertain seasonal source and sink strengths in the arctic regions is difficult to obtain. However, there are now a reasonable quantity of data for this polar region to estimate sources and sinks within the Arctic which may contribute significantly to the annual tropospheric CO2 concentration fluctuation. The sea-ice-air and the sea-air interfaces account for most of the contribution to the sources and sinks for carbon dioxide. Although the arctic and subarctic region is small in extent, it certainly is not impervious and ice sealed. Our estimate, based on historical data and current research, indicates that the Arctic, which is about 4% of the Earth's surface, is an annual net sink for approx. 10 to the 15th power g CO2 accounting for an equivalent of approx. 3% of the annual anthropogenic contribution of CO2 to the troposphere. DOE

N83-28755# Alaska Univ., Fairbanks.
ARCTIC TROPOSPHERE CARBON DIOXIDE: LOW-ALTITUDE AIRCRAFT SAMPLING
T. A. Gosink and J. J. Kelley 1982 13 p refs
(Contract DE-AT06-80EV-10429)
(DE82-013681; DOE/EV-10429/5) Avail: NTIS HC A02/MF A01

Data from low altitude aircraft sampling for CO2 in the arctic atmosphere are presented. The data cover the period from late spring to late summer when environmental changes at the tundra and sea ice are most pronounced. The effect of regional sources and sinks for CO2 on the lower troposphere are shown. The annual ice and open water zones of the Arctic Ocean covered by the flights transects appear to act as a potential sink for carbon dioxide. DOE

N83-28756# Oak Ridge National Lab., Tenn. Environmental Sciences Div.
CONSTRUCT FOR ANALYSIS OF ECOSYSTEM PERTURBATIONS BASED ON INPUT/OUTPUT ANALYSIS
J. E. Richey (Washington Univ.), D. P. Lettenmaier (Washington Univ.), and F. S. Sanders Dec. 1982 105 p refs
(Contract W-7405-eng-26)
(DE83-005979; ORNL/TM-7256; ORNL-ESD-1991) Avail: NTIS HC A06/MF A01

The integrity of an ecosystem as a whole which was affected by perturbation was determined. A construct is developed based on the material flow characteristics of systems, that is an alternative or complement to the traditional methods of inventory and simulation. The theory and principles of the methodology are developed and a preliminary feasibility study is conducted by testing the construct of case histories of Lake Washington and Findley Lake. Cases tested included monthly, seasonal, and annual analyses of Lake Washington carbon data at two levels of aggregation; seasonal and annual analyses of carbon, phosphorus, and nitrogen data for 2 years for Findlay Lake; and a four lake comparison of the use of dissolved inorganic carbon (DIC) as an endogenous or exogenous term in carbon born budgets. the problems of time, compartment, material aggregation, the problems of construct sensitivity to tracing changes, and on the development of an overall system index are emphasized. DOE

N83-28757# Los Alamos Scientific Lab., N. Mex.
REGIONAL AIR QUALITY IN THE FOUR CORNERS STUDY REGION
David H. Nochumson 1982 22 p refs Presented at the 75th Ann. Meeting on the Air Pollution Control Assoc., New Orleans, 20-25 Jun. 1982
(Contract W-7405-eng-36)
(DE82-011984; LA-UR-82-671; CONF-820627-2) Avail: NTIS HC A02/MF A01

The body of information presented in this paper is directed to policy makers, regulators, and energy planners concerned with the effect of energy development and alternative regulatory policies on regional air quality in the Four Corners Study Region. This study was one of 5 regional studies conducted for the National Commission on Air Quality (NCAQ). Potential regional air quality impacts were evaluated out to the year 1995 for alternative energy scenarios under current and alternative regulatory policies. Highlights of the results from the regional air quality analysis are discussed in this paper. DOE

N83-28758# Oak Ridge National Lab., Tenn. Environmental Sciences Div.
GENERIC ENVIRONMENTAL ASSESSMENT REPORT FOR CONVENTIONAL FUEL-ALCOHOL PLANTS
J. L. Elmore, E. D. Waits, F. E. Sharples, D. B. Hunsaker, Jr., S. A. Carnes, M. Schweitzer, and J. F. McBrayer Aug. 1982 134 p refs
(Contract W-7405-eng-26)
(DE82-018187; ORNL/TM-7993; ESD-Publ-1848) Avail: NTIS HC A07/MF A01

The environmental impacts of commerical scale fuel alcohol plants of conventional design are assessed. Commercial scale is defined as an annual production capacity of 60 x 10 to the 7th power to 6.0 x 10 to the 8th power L (16 x 10 to the 7th power to 1.6 x 10 to the 8th power gal). Conventional fuel alcohol plant use grains and sugar crops as feedstocks; dehydrate with benzene, ethylene glycol, ethyl ether, or gasoline; and use coal, natural gas, wood, or bagasse for process heat. Environmental controls to limit impacts are readily available. The greatest potential impacts derive from liquid process waste streams, which have high biochemical oxygen demand (BOD) and possibly high metal concentrations, and from atmospheric emission arising from coal or biomass fired boilers. Both sources of emissions are regulated, and control technology exists to comply with those regulations. Impacts to the socioeconomic environment were assessed to be of concern only in the case of large plants in rural environments. DOE

N83-28759# Dynatech R/D Co., Cambridge, Mass.
DEVELOPMENT OF GUIDELINES FOR OPTIMUM BAGHOUSE FLUID-DYNAMIC-SYSTEM DESIGN Final Report
D. Eskinazi and G. B. Gilbert Jun. 1982 198 p refs Sponsored by EPRI
(EPRI Proj. 1129-5)
(DE82-905788; EPRI-CS-2427) Avail: NTIS HC A09/MF A01

In recent years, the utility industry has turned to fabric filters as an alternative technology to electrostatic precipitators for particulate emission control from pulverized coal-fired power plants. One aspect of baghouse technology which appears to be of major importance in minimizing the size, cost, and operating pressure drop is the development of ductwork and compartment designs which achieve uniform gas and dust flow distribution to individual compartments and bags within a compartment. The objective of this project was to perform an experimental modeling program to develop design guidelines for optimizing the fluid mechanic performance of baghouses. Tasks included formulation of the appropriate modeling techniques for analysis of the flow of dust-laden gas through the collector system and extensive experimental analysis of fabric filter duct system design. DOE

N83-28760# Franklin Associates, Prairie Village, Kans.
ESTIMATES OF AIR AND WATER POLLUTANTS AND ENERGY CONSUMPTION FROM THE PRODUCTION OF RAW MATERIALS USED IN WIND-ENERGY SYSTEMS
William L. Bider, Larry E. Seitter, Lynn E. Bertuglia, and Robert G. Hunt Apr. 1982 222 p refs Prepared for Midwest Research Inst., Golden, Colo.
(Contracts EG-77-C-01-4042; DE-AC02-77CH-00178)
(DE82-015247; SERI/TR-09230-1) Avail: NTIS HC A10/MF A01

Data are presented which quantify the energy and environmental impacts associated with the manufacture of wind energy system components. The components are examined in terms of the basic materials used: steel, aluminum, copper, fiberglass, concrete and wood. Impact data quantify energy consumption, air and water

pollutant emissions, solid waste generation, and transportation impacts per 1000 pounds of product made from each material. The detailed industrial process data from which total material impacts were calculated are appended for each material. DOE

N83-28761# Sandia Labs., Albuquerque, N. Mex. Dept. 4770.
BENEFICIAL USES OF NUCLEAR WASTE/SEWAGE SLUDGE IRRADIATION PROJECT Progress Report, Apr. - Sep. 1981
B. D. Zak, ed. May 1982 75 p refs
(Contract DE-AC04-76DP-00789)
(DE82-015498; SAND-82-0069) Avail: NTIS HC A04/MF A01

Further development and transfer of sludge irradiation technology to the municipal sector is discussed. A number of sludge irradiation demonstration plants were constructed and placed in operation by municipalities across the country. The following program elements were established to ensure successful accomplishment of the program objectives: technology transfer by means of municipal demonstration plants; research support and data base development through operation of the SIDSS (Sandia Irradiator for Dried Sewage Solids) pilot plant; engineering support for the demonstration plants to include required support for NEPA/licensing activities, risk assessment, safety, and basic design engineering support; life sciences and agricultural R and D support for base program activities and for demonstration plants; quality assurance activities to support licensing and other requirements; and program management. DOE

N83-28762# Pennsylvania State Univ., University Park. Dept. of Chemistry.
INSTRUMENTAL METHODS OF ANALYSIS OF SULFUR COMPOUNDS IN SYNFUEL PROCESS STREAMS Quarterly Technical Progress Report, Jan. - Mar. 1982
Joseph Jordan, John Stahl, and Joseph Yakupkovic Apr. 1982 19 p refs
(Contract DE-FG22-81PC-40783)
(DE82-016125; DOE/PC-40783/T6) Avail: NTIS HC A02/MF A01

Polysulfides were found to rearrange to longer average chain lengths during titration with p-hydroxymercuribenzoate (HMB). Such rearrangement was relatively rapid and reproducible for a given pH, producing tetrasulfide at pH14. The reaction of cyanide and HMB was investigated, yielding approximate thermodynamic assignments. The literature on the voltammetry of the moieties S2O4(-2), S2O6(-2), S3O6(-2), S4O6(-2), S5O6(-2) is reviewed. These moieties exhibit different half wave potentials, on the basis of which speciation might be feasible. Analytically viable diffusion controlled currents were also reported for a majority of the moieties. Carefully controlled conditions are maintained (buffers, supporting electrolytes) in order to suppress anomalies (maxima, etc.) and obtain well defined limiting current domains. Total accounting of the sulfur balance in representative samples of synfuel progress streams is made. DOE

N83-28763# Washington Univ., Seattle.
TRACE-METAL CHARACTERIZATION AND SPECIATION IN GEOTHERMAL EFFLUENT BY MULTIPLE-SCANNING ANODIC-STRIPPING VOLTAMMETRY AND ATOMIC-ABSORPTION ANALYSIS Final Report
Bruce R. Kowalski 1982 11 p
(Contract DE-AT06-76EV-70048)
(DE82-018603; DOE/EV-70048/T1) Avail: NTIS HC A02/MF A01

The in-field sampling equipment constructed, procedures developed or adapted, and the results obtained on representative samples taken from geothermal sites are described. DOE

N83-28764# Oak Ridge National Lab., Tenn.
MULTIMEDIA SCREENING-LEVEL MODEL FOR ASSESSING THE POTENTIAL FATE OF CHEMICALS RELEASED TO THE ENVIRONMENT
L. M. McDowell-Boyer and D. M. Hetrick Jun. 1982 61 p refs
(Contract W-7405-eng-26)
(DE82-018185; ORNL/TM-8334) Avail: NTIS HC A04/MF A01

A screening-level multimedia model was developed to assess the potential for environmental accumulation of chemicals released to air, surface water, or soil. This model (named TOX-SCREEN) was developed to provide a means of rapidly evaluating chemicals with respect to their ultimate potential for accumulation in biota. The model is simplified in nature, and is intended for use as a screening device to identify chemicals that are highly unlikely to pose a problem even under conservative assumptions. In order to minimize data collection for users, a generic approach to simulating pollutant transport in the environment was taken. The model assumes a generic positioning of surface water bodies relative to atmospheric pollutant sources and contaminated land areas. The multimedia nature of TOX-SCREEN requires that physical/chemical processes which drive transport of chemicals across media (i.e., air, water, and soil) interfaces be simulated. DOE

N83-28765# Los Alamos Scientific Lab., N. Mex.
HEAT-FLOW RECONNAISSANCE OF THE GULF COASTAL PLAIN
D. L. Smith and S. S. Shannon, Jr. Apr. 1982 40 p refs
(Contract W-7405-eng-36)
(DE82-015898; LA-9222-HDR) Avail: NTIS HC A03/MF A01

Most of the 46 new values of heat flow determined for the Gulf Coastal Plain are in the low to normal range, but heat flow values averaging 1.8 heat flow unit (HFU) were obtained in Claiborne, Ouachita, and Union parishes, Louisiana. Moreover, a zone of relatively high heat flow values and steep thermal gradients (35 to 46 C/km) extends from northern Louisiana into southwestern Mississippi. Also near Pensacola, Florida, temperatures of 50 C at 1 km depth were extrapolated from thermal gradients. Future development of low grade geothermal resources may be warranted in these areas. DOE

N83-28766# Texas Univ., Austin. Bureau of Economic Geology.
ENVIRONMENTAL BASELINE MONITORING IN THE AREA OF GENERAL CRUDE OIL-DEPARTMENT OF ENERGY PLEASANT BAYOU NUMBER 2: A GEOPRESSURED GEOTHERMAL TEST WELL, 1980 Annual Report
Thomas C. Gustavson, Rory C. Howard, and Douglas McGookey 1982 253 p refs
(Contract DE-AC08-79ET-27111)
(DE82-018119; DOE/ET-27111/7) Avail: NTIS HC A12/MF A01

Baseline air and water quality of the test well site, a summary of microseismic activity before and during 1980, and a description of the monitoring of a liquid tiltmeter at the test well site are described. DOE

N83-28767# Department of Energy, Las Vegas, Nev.
REDAR: THE RADIATION AND ENVIRONMENTAL DATA ACQUISITION AND RECORDER SYSTEM
Joel E. Jobst 1982 12 p refs Presented at the Meas. Sci. Conf., San Diego, Calif., 21 Jan. 1982 Prepared in cooperation with Edgerton, Germeshausen and Grier, Inc., Las Vegas, Nev.
(Contract DE-AC08-76NV-01183)
(DE82-005439; EGG-1183-1810; CONF-820111-1) Avail: NTIS HC A02/MF A01

Radiation and Environmental Data Acquisition and Recorder Model IV, is a multi-microprocessor, portable data acquisition and real time analysis system. It was recently designed for use in severe environments aboard helicopters, fixed-wing aircraft, and various land vehicles. Nuclear radiation measurement, geographic position, and environmental data are simultaneously acquired, displayed on a CRT and multiple LED readouts, and recorded on cartridge tapes for post mission analysis on minicomputer systems. DOE

N83-28768# Brookhaven National Lab., Upton, N. Y. Environmental Chemistry Div.
REAL-TIME INSTRUMENT FOR AMBIENT MONITORING OF HYDROGEN SULFIDE, DIMETHYL SULFIDE AND OTHER REDUCED ORGANOSULFUR SPECIES USING OZONE CHEMILUMINESCENT DETECTION

Thomas J. Kelly, Mary P. Phillips, Roger L. Tanner, and Jeffrey S. Gaffney 1982 16 p refs Presented at the 75th APCA Ann. Meeting, New Orleans, 20-25 Jun. 1982
(Contract DE-AC02-76CH-00016)
(DE82-016215; BNL-31252; CONF-820627-5) Avail: NTIS HC A02/MF A01

The chemiluminescent reactions of H2S and other gaseous sulfides with ozone at 298 K were investigated, with the aim of developing a simple, selective, real time monitor for these naturally emitted compounds. A commercial chemiluminescent ozone monitor was adapted, for detection of the ozone/sulfide chemiluminescence between 300 and 400 nm wavelength. Excess ozone was supplied to the reaction chamber from an electrical discharge ozone source. Response to dimethyl sulfide was enhanced by the use of air in the ozone source rather than oxygen. This effect was found to be caused by presence of oxides of nitrogen produced in the ozonizer; a similar enhancement was not observed for the other sulfide compounds studied. Observed chemiluminescence signal decreased in the order CH3SH > CH3SCH3 > H2S > thiophene, with detection limits of 0.1, 0.3, 4, and 12 ppb respectively, at an instrument time constant of 60 sec. DOE

N83-28769# California Univ., Livermore. Lawrence Livermore Lab.
SLAB: A TIME-DEPENDENT COMPUTER MODEL FOR THE DISPERSION OF HEAVY GASES RELEASED IN THE ATMOSPHERE
David L. Morgan, Jr., Louise K. Morris, and Donald L. Ermak 20 Jan. 1983 17 p refs
(Contract W-7405-eng-48)
(DE83-008724; UCRL-53383) Avail: NTIS HC A02/MF A01

The SLAB model describes the dispersion and gravity flow of a heavy gas released into the atmosphere at ground level, using a crosswind averaged form of the conservation equations of mass, momentum, species, and energy. The model is time dependent and one dimensional in that the equations depend on only one spatial dimension, downwind distance. The model is quasi three dimensional since it contains equations to determine the crosswind dimensions of the dispersing cloud. Specific submodels are included to describe wind speed as a function of height, air entrainment into the cloud as the result of turbulent mixing, and heat and momentum flow between the cloud and the ground beneath it and the air surrounding it. The SLAB computer code determines the properties of the dispersing heavy gas cloud by employing the method of lines to numerically integrate the partial differential equations that comprise the model. DOE

N83-28770# National Bureau of Standards, Washington, D.C. National Engineering Lab.
WORKSHOP ON COMBUSTION PRODUCT TOXICITY SUMMARY OF PRESENTATIONS
J. E. Snell, B. C. Levin, and A. J. Fowell Jan. 1983 68 p Workshop held in Gaithersburg, Md., 10 Sep. 1982
(PB83-157479; NBSIR-82-2634) Avail: NTIS HC A04/MF A01 CSCL 06T

The development of a test method for the assessment of the acute inhalation toxicity of combustion products was described. This test method is intended for research and for preliminary screening purposes by product researchers and material manufacturers in developing and evaluating materials. The test method is not intended to be used itself in evaluating the suitability of a material for specific application since additional factors must be considered. The NBS test method for assessing acute inhalation toxicity of combustion products and to provide an opportunity for discussion of its appropriate use is outlined. GRA

N83-28771# National Oceanic and Atmospheric Administration, Boulder, Colo. Office of Marine Pollution Assessment.
SUMMARY RESULTS OF INSTEP (INNER SHELF SEDIMENT TRANSPORT PROJECT) PROJECT: NEW YORK BIGHT MARINE GEOLOGY
Thomas L. Clarke, Robert A. Young, William F. Stubblefield, Donald J. P. Swift, Terry A. Nelsen, and George L. Freeland Dec. 1982 31 p refs
(PB83-156828; NOAA-TM-OMPA-23) Avail: NTIS HC A03/MF A01 CSCL 08C

Following a brief history of the INSTEP project, the data and scientific results produced by the project are summarized. In each of the three main study areas, seafloor inventory, suspended particulate measurements, and boundary layer measurements and modeling, the types of data taken and the methods used are briefly summarized. GRA

N83-28772# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Civil Engineering.
ASSESSING MICROBIALLY MEDIATED WATER QUALITY PROBLEMS IN DISTRIBUTION SYSTEMS Final Report
William R. Knocke and Gregory D. Boardman 1982 215 p refs (OWRT Proj. B-120-VA)
(PB83-150045; W83-01573; OWRT-B-120-VA(1)) Avail: NTIS HC A10/MF A01 CSCL 13B

A review of various aspects of water quality problems that develop in distribution systems during water transmission by surveying water utility problems and responses to customer complaints and by conducting field monitoring studies of water quality concerns and laboratory studies related to monitoring and control techniques was sought. Specifically, the potential for microorganisms to biologically mediate chemical changes in distribution systems was assessed; the use of concentration techniques for providing a representative microbial sample from distribution systems was examined; and the use of chlorine and other disinfectants for control of microorganisms was examined. Most water utilities lack fundamental data necessary to assess accurately water quality problems in distribution systems. GRA

N83-28773# Arkansas Univ., Fayetteville. Water Resources Research Center.
ATRAZINE DEGRADATION, SORPTION, AND BIOCONCENTRATION IN WATER SYSTEMS Progress Report, 1 Oct. 1979 - 31 Mar. 1981
Duane C. Wolf and Ramon L. Jackson Aug. 1982 49 p refs
(PB83-150151; W83-01607; OWRT-B-062-ARK(1); PUB-87) Avail: NTIS HC A03/MF A01 CSCL 13B

The herbicide atrazine is used extensively to control broadleaf and grass weeds in such crops as sorghum and corn. A small portion of the atrazine may be lost from the area of application by surface runoff and could enter a stream or lake. Once the atrazine enters a water system, the partitioning of atrazine between the aqueous and solid phases of the water-sediment system largely determines the impact of the herbicide on water quality and aquatic ecosystems. The results of studies on water-sediment systems indicated that sediments with lower pH values and higher organic matter levels adsorbed higher levels of atrazine than sediments with neutral pH values and lower organic matter levels. Microbial decomposition of the herbicide was slow. DOE

N83-28774# Gulf Coast Research Lab., Ocean Springs, Miss. Analytical Chemistry Sect.
POLLUTANT TRANSPORT IN MISSISSIPPI SOUND Interim Technical Report
Thomas F. Lytle and Julia S. Lytle Nov. 1982 25 p refs
(Grant NA81AA-D-00050; Proj. R/ER-2(1981))
(PB83-152330; MASGP-82-015; ITR-3) Avail: NTIS HC A02/MF A01 CSCL 13B

Pollution issues affecting present and future development of coastal areas of Mississippi were addressed. The pollutant levels and locations within the Sound were characterized. An extensive sampling and analysis program involving collection of both surface sediments and sediment cores from throughout the entire Mississippi Sound was initiated in 1979. GRA

N83-28775# Louisiana Univ. Marine Consortium, Chauvin.
PROCEEDINGS OF THE CONFERENCE ON COASTAL EROSION AND WETLAND MODIFICATION IN LOUISIANA: CAUSES, CONSEQUENCES, AND OPTIONS
Donald F. Boesch, ed. Sep. 1982 266 p refs Conf. held in

Baton Rouge, 5-6 Oct. 1981 Sponsored by Fish and Wildlife Service, Dept. of the Interior
(PB83-152777; FWS/OBS-82/59) Avail: NTIS HC A12/MF A01 CSCL 13B

This volume contains 16 papers and panel discussions from a conference held in Baton Rouge, La., 5-6 October 1981. The presentations consider the causes and consequences of coastal erosion and wetland modification in Louisiana and the mitigative options available to slow or reverse the rapid rate of coastal land loss. Detailed habitat mapping studies have allowed accurate estimates of coastal habitat change and land loss through 1978. The projected effects of wetland modification on the bountiful living resources of coastal Louisiana (fisheries, fur and hide bearers and waterfowl) are major because of the close dependence of these resources on estuarine wetlands. Author (GRA)

N83-28776# Energy and Environmental Analysis, Inc., Arlington, Va.
ASSESSMENT OF THE EFFECTS OF ACTIVE SOLAR THERMAL TECHNOLOGIES ON URBAN EMISSIONS Final Report, Sep. 1979 - Jul. 1980
Jan. 1983 112 p refs
(Contract EPA-68-03-2622)
(PB83-156927; EPA-600/7-83-008) Avail: NTIS HC A06/MF A01 CSCL 13B

Fuel displacement potential of solar technologies were analyzed to determine if the potential air quality benefits are significant enough to justify the promotion of solar commercialization as an air pollution control strategy. Fuel displacement by solar energy was found to be greatest in the residential water heating market and in electric end uses. However, the results suggest a limited role for solar energy in reducing air pollutant emissions. Emission reductions were relatively small, generally less than one percent. Generalizing these findings to the entire nation is cautioned against, since areas that were the most technically compatible with solar systems were not evaluated. Solar systems could readily be a viable emission reduction strategy in a specific case. GRA

N83-28777# General Research Corp., McLean, Va. Office of Resource Management Operations.
INVENTORY OF ACID DEPOSITION RESEARCH PROJECTS FUNDED BY THE PRIVATE SECTOR Final Report, Jan. - Oct. 1982
John D. Wisniewski and Joe Kinsman 22 Nov. 1982 315 p Sponsored by Gas Research Inst., EPRI, American Petroleum Inst. and Edison Electric Inst.
(PB83-167262; GRI-82/0023; Rept-1277-01-82-CR) Avail: NTIS HC A14/MF A01 CSCL 13B

One hundred twenty-four privately funded acid rain research projects, each with funding over $5000, were documented. Individuals from over 13 industry/special interest groups were contacted (including gas, electric, petroleum, paper, coal, automobile, etc.). Information was solicited on research in the following areas: emissions, transport, chemistry, removal/deposition, collection/analysis, environmental effects, mitigation, legal, and economics. For each inventoried project, the following information was obtained: project title, funding organization, project officer, research organization and principal investigator, period of performance, funding, research objectives, project description, and expected output. GRA

N83-28778# University of Western Michigan, Kalamazoo. Dept. of Chemistry.
FUNDAMENTALS OF NITRIC OXIDE FORMATION IN FOSSIL-FUEL COMBUSTION Quarterly Progress Report, 29 Sep. - 28 Sep. 1981
Thomas Houser and Michael E. McCarville May 1982 11 p refs
(Contract DE-FG22-810C-40805)
(DE82-016830; DOE/PC-40805/1; QPR-1) Avail: NTIS HC A02/MF A01

Kinetic and product distribution data was obtained using an atmospheric pressure flow system from which a mechanism for NO formation from the combustion of fuel nitrogen may be developed. The results of previous studies of the inert pyrolysis and oxidation of pyridine and of the oxidation of HCN and cyanogen are briefly discussed. HCN is the primary, volatile nitrogen containing intermediate formed during the combustion of fuel nitrogen, thus, this program is concerned with continuing the determination of the oxidation characteristics of HCN as well as those of pyridine. Several exploratory experiments were made determining the NO/sub x/ yields over wide ranges of concentrations (including CO and benzene as additives to HCN), temperatures and times. More complete measurements will be made after the new gas chromatograph is operational. DOE

46 GEOPHYSICS

Includes aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism.

For space radiation see *93 Space Radiation.*

N83-28779 Colorado Univ., Boulder.
LATE QUATERNARY HISTORY OF SOUTHERN BAFFIN ISLAND, CANADA: A STUDY OF FORAMINIFERA AND SEDIMENTS FOR FROBISHER BAY Ph.D. Thesis
Lisa Ellen Osterman 1982 402 p
Avail: Univ. Microfilms Order No. DA8221112

Three piston cores from Frobisher Bay, Baffin Island, Canada, were analyzed to determine the glacial history, and to test the maximum versus minimum model of the 18,000 BP Laurentide reconstruction. Radiocarbon dating indicates there is a continuous record from 27,225 + or - 1250 BP to the present, during which there is evidence for only one glaciation, the Hall advance, which advanced over two of the core sites as an ice shelf at 11,000 BP. The postulated Frobisher Bay ice shelf was floating over the deep trough of Frobisher Bay, but was grounded on the Calanus Shelf to form the Calanus ice rise which formed the moraines in the Gold Cove/Countess of Warwick Sound area (Miller, 1980). The Frobisher Bay cores record the biological and sedimentological changes associated with a glacial advance and retreat, from which a glacial environmental facies model is developed that can be used to interpret the position of the glacier terminus in other stratigraphic sections and marine cores. Dissert. Abstr.

N83-28780 California Univ., Santa Cruz.
EVOLUTION OF THE FOREARC LANDWARD OF THE MIDDLE-AMERICA TRENCH, NICOYA PENINSULA, COSTA RICA AND SOUTHERN MEXICO Ph.D. Thesis
Neil Scott Lundberg 1982 279 p
Avail: Univ. Microfilms Order No. DA8226314

Structural features in DSDP Leg 66 cores correlate distinct tectonic environments and basement types landward of the Middle America Trench off southern Mexico. The lower slope, underlain by landward dipping reflectors, exhibits inconsistent bedding dip stratal disruption, and scaly mudstone. The upper slope, underlain principally by continental crust exhibits mesoscopic folding, spaced foliation, and veins. A transition zone is distinguished by predominantly oblique slip faults. The Nicova Peninsula of Costa Rica represents an uplifted trench slope break composed of the Nicoya Complex and its sedimentary cover. The Nicoya Complex is Upper Mesozoic oceanic crust, showing effects of continued igneous activity and deformation throughout the evolution of this intraoceanic arc trench system. Nicoya Complex sediments are open ocean deposits, comprising radiolarian cherts, black shales, deep water limestones and intraformationally derived sedimentary breccias and sandstones. Dissert. Abstr.

N83-28781 Florida State Univ., Tallahassee.
BIOSTRATIGRAPHY OF THE HAWTHORN FORMATION IN NORTHEAST AND NORTH CENTRAL FLORIDA Ph.D. Thesis
Ronald Woodrow Hoenstine 1982 268 p
Avail: Univ. Microfilms Order No. DA8225287

Cores recently drilled along Florida's east coast by the Florida

Bureau of Geology have yielded a record of the most complete Florida Hawthorn fossiliferous sediments heretofor available for biostratigraphic analysis. The record of Hawthorn deposition extends from the Early Miocene in sediments near the base of this formation in Nassau County to what appears to be Early Pliocene time in core sediments present in Indian River and St. Lucie counties. A diversity of microfossil groups including diatoms, silicoflagellates, foraminifera and coccoliths were identified in the Hawthorn sediments. Diatoms, which represented the largest and most definitive number of species, where the primary group used to determine the biochronology and paleoenvironmental interpretations of this important phosphate-bearing formation. Three biostratigraphic zones of Middle Miocene to Late Middle Miocene age can be recognized in the Hawthorn sediments (Coscinodiscus plicatus, Coscinodiscus plicatus/Delphineis penelliptica, Delphineis penelliptica zones). Dissert. Abstr.

N83-28782 Texas A&M Univ., College Station.
STRUCTURAL ANALYSIS OF THE POLOCHIC FAULT ZONE IN WESTERN GUATEMALA, CENTRAL AMERICA Ph.D. Thesis
Carlos Arturo Dengo 1982 326 p
Avail: Univ. Microfilms Order No. DA8226081

The deformation adjacent to, and within, a 40 km segment of the seismogenic Polochic fault zone is studied with a view towards investigating the processes and environment of deformation within the fault zone, and from these identify mechanical properties, important to the earthquake process. The regional deformation is studied in order to relate the amount, and distribution of displacement along the Polochic fault to the deformation within the fault zone. The regional analysis focuses on two major structures: a high angle reverse fault (Rio Ocho fault) and a fault north of the Polochic (Taluca fault). It is shown that (1) the Rio Ocho fault must correspond in age with the Cenozoic fold belt, (2) both predate the Polochic fault, (3) the Rio Ocho and adjacent sedimentary rocks have subsequently deformed to accommodate fault induced strain, and (4) these deformations are produced by combined pure and simple shear. The Taluca fault is shown to be a left lateral, strike slip fault which is structurally continuous with the Polochic fault. Dissert. Abstr.

N83-28783 South Carolina Univ., Columbia.
SELECTED GEOLOGIC STUDIES IN THE CENTRAL AND SOUTHWESTERN VIRGINIA PIEDMONT Ph.D. Thesis
James Franklin Conley 1982 196 p
Avail: Univ. Microfilms Order No. DA8220195

This dissertation contains four separate papers. The first paper describes how volcanogenic massive sulfide deposits that occur in the Chopawamsic Formation in central Virginia migrated into the cores of isoclinal folds. The second paper provides evidence that the kyanite quartzites at Willis and Woods mountains in central Virginia and the quartzites at the base of the Arvonia Formation, are correlative. Observations supporting this conclusion are similar mineral content, stratigraphic position, and structural evidence. The third paper is a study of the petrology and geochemistry of the Martinsville igneous complex, which intrudes rocks of the Smith River allochthon. In the last paper it is proposed that the Lynchburg Formation in the southwestern Virginia Piedmont contains ophiolites. The Lynchburg in this area is composed of a succession of metamorphosed ultramafic, gabbroic and basaltic rocks overlain primarily by metagraywackes and graphic metapellites. Dissert. Abstr.

N83-28784 Washington Univ., Seattle.
VOLCANIC STRATIGRAPHY OF PART OF MCLENDON VOLCANO, YAVAPAI COUNTY, ARIZONA Ph.D. Thesis
William Earl Brooks, Jr. 1982 132 p
Avail: Univ. Microfilms Order No. DA8226525

McLendon volcano, 70 km northwest of Wickenburg, Arizona, is a 100 sq km composite Miocene volcano that lies within the transition zone between the Colorado Plateau and the Basin and Range provinces. Only the northeast flank of a larger, but now disrupted, volcanic center remains. Field, petrographic, and geochemical data from the study area are used to define lava chemistry, location of the central vent, and the relationship of this calcalkaline volcano to genetically similar volcanoes. Volcanic stratigraphy at McLendon volcano comprises a basal section of basalts and andesites of unknown extent erupted upon Precambrian rocks. A 400 m volcaniclastic section of pyroclastic and reworked facies conformably overlies the basal mafic unit. Lithology and geochemistry of the McLendon lavas show a calcalkaline affinity similar to other volcanic suites from the transition zone. This association is comparable to the calc-alkaline provinces of the Aleutians, Cascades, and New Zealand. Dissert. Abstr.

N83-28785 Georgia Univ., Athens.
OXYGEN ISOTOPE, FLUID INCLUSION, MICROPROBE AND PETROGRAPHIC STUDIES OF THE PRECAMBRIAN GRANITES FROM THE SOUTHERN WIND RIVER RANGE AND THE GRANITE MOUNTAINS, CENTRAL WYOMING, U.S.A.: CONSTRAINTS ON ORIGIN, HYDROTHERMAL ALTERATION AND URANIUM GENESIS Ph.D. Thesis
Kok Keong Cheang 1982 154 p
Avail: Univ. Microfilms Order No. DA8225182

The Granite Mountain is comprised of the granite of Long Creek Mountain and the volumetrically dominant granite of Lankin Dome. Average delta 018 O values in per mil deg/00 of the granite of Long Creek Mountain is 8.2 + or - 0.3 deg/00 (N = 4) and average delta 018 8.5 + or - -0.5 deg/00 (N = 37), values of the two phases from the granite of Lankin Dome are: biotite granites = delta 018 8.5 + or 0.5 deg/00 (N = 37), leucocratic graphite = 8.4 + or - 0.3 deg/00 (N = 12). The average delta 018 values for Louis Lake Batholith are: hornblende-biotite granodiorite = 7.3 + or - 0.3 deg/00 (N = 13) and leucocratic biotite granite = 7.7 + or - 0.1 deg/00 (N = 6). It is concluded from the whole rock oxygen isotopic, mineralogical, chemical and strontium isotopic data that the unaltered granites in the Granite Mountains were probably derived from a uranium enriched source with some peraluminous metasedimentary component which favoured the preconcentration of uranium and thorium, whereas the Louis Lake Batholith was formed by partial melting of igneous source materials that are not strongly enriched in uranium. Dissert. Abstr.

N83-28786 California Univ., Santa Barbara.
LEAD ISOTOPE EVIDENCE FOR CRUST-MANTLE INTERACTION DURING MAGMAGENESIS IN THE SOUTH SANDWICH ISLAND ARC AND IN THE ANDES OF SOUTH AMERICA Ph.D. Thesis
Barbara Anne Barreiro 1982 185 p
Avail: Univ. Microfilms Order No. DA8224634

Lead isotopic compositions of volcanic and plutonic rocks can be used to trace the sources of intra-oceanic and continental-margin arc magmas. Lead isotope ratios have been measured in twelve volcanic rocks from the South Sandwich islands, an intra-oceanic island arc. In Pb-Pb correlation diagrams, the data plot distinctly above the oceanic igneous rock regression line (ORL), and yield trends showing apparent mixing with 2-10% subducted sediment end member as given by South Atlantic pelagic sediments reported by Chow and Patterson (1962). Quaternary volcanic rocks of the Andes have passed through 30-70 km of continental crust, and their Pb isotopic compositions record varying amounts of interaction. The lavas from the Northern and Southern Andes are fairly homogeneous with respect to Pb isotopic composition. The isotope data can be accounted for by small amounts of contribution from subducted sediments or minor continental crustal contamination. Dissert. Abstr.

N83-28787 Oregon Univ., Eugene.
GEOLOGY AND PETROLOGY OF THE WOOLEY CREEK BATHOLITH, KLAMATH MOUNTAINS, NORTHERN CALIFORNIA Ph.D. Thesis
Calvin Glenn Barnes 1982 287 p
Avail: Univ. Microfilms Order No. DA8224822

The Wooley Creek batholith was intruded into metamorphic rocks of the western Paleozoic and Triassic belt (TrPz) of the Klamath Mountains 162 + or -2 my ago. The batholith crosscut a

thrust fault between the lowest subunit of the TrPz, the Rattlesnake Creek terrane, and overlying Hayfork terrain metasediments. Contact metamorphic assemblages in the wall rocks show that the structurally deepest part of the pluton crystallized at about 7.5kb whereas the structurally shallowest part crystallized at about 3kb. The batholith and its host rocks were subsequently thrust over low-density rocks of the Galice Fm. and then tilted toward the southwest, presumably by regional doming. The Wooley Creek batholith is gradationally zoned from two-pyroxene gabbro in the deepest part to hornblende-biotite granite in the shallowest part. The plutonic rocks fall on two distinct chemical trends that correspond to rocks that contain pyroxene and rocks with only hornblende and biotite as mafic minerals. Pyroxene-bearing rocks are structurally lower and are enriched in Mg, Ca, Cr, Ni, Co, and Sc. Dissert. Abstr.

N83-28788 Texas A&M Univ., College Station.
A STUDY OF ATMOSPHERIC FLOW IN THE WAKE OF A LARGE STRUCTURE Ph.D. Thesis
David Dar-Way Chu 1981 92 p
Avail: Univ. Microfilms Order No. DA8225489

A theoretical-empirical study was performed to establish the structure of the velocity and pressure fields in the wake of an airport hangar. For the theoretical aspect, the perturbation technique was applied to the hydrodynamic equations for steady-state turbulent flow. The equations were put into non-dimensional form by the use of dimensions of the structure and the assumption that the basic or reference flows fit the logarithmic profile in the vertical. Observational values of the wind within a wake at a height of 2.4 m were used to establish the values of two parameters which were needed to complete the solution. Tables and graphs show the resulting computations of the flow and pressure deviation fields in three dimensions. The patterns seem reasonable for a region extending upward to about 1.5 h, where h is the height of the structure. However, the flow patterns above this level are suspect. Dissert. Abstr.

N83-28789 Saint Louis Univ., Mo.
REGIONALIZATION OF CRUSTAL Q IN THE CONTINENTAL UNITED STATES Ph.D. Thesis
Sudarshan Singh 1981 203 p
Avail: Univ. Microfilms Order No. DA8223731

Recent studies indicate that there are strong lateral variations of anelastic attenuation of seismic waves beneath the continental United States. In this study a detailed crustal Qo map for the entire continental United States is obtained. The method is based on a scattering model to explain the coda waves of local and near regional earthquakes. These coda Qo values are in good agreement with Q of Lg-waves. Using 25 WWSSN and 27 LRSM stations and over 250 local earthquakes, short epicenter-station paths were selected which give a maximum coverage to the entire continental United States. Based on a single-scattering model, a generalized inversion method is developed and used to obtain Qo values. Dissert. Abstr.

N83-28790 Saint Louis Univ., Mo.
AN ANALYSIS OF THE MONSOON BOUNDARY LAYER OVER THE ARABIAN SEA EMPLOYING FAST-RESPONSE, AERIAL TURBULENCE DATA Ph.D. Thesis
Walter Dale Meyer 1982 221 p
Avail: Univ. Microfilms Order No. DA8223703

The role of meso-scale (less than 10 km) turbulent exchange processes in maintaining convection in the Indian monsoon boundary layer (BL) in disturbed and undisturbed conditions is investigated using fast-response (20 samples sec-1) turbulence data. The data were collected as part of Summer MONEX on 20 and 24 June 1979 by the NCAR Electra during low-level flights over the southeastern Arabian Sea. The Electra completed 29 turbulence runs on the two days at levels from 80 to 1600 meters. Turbulence flux estimates are classified according to the intensity of monsoon convection (i.e., disturbed and undisturbed conditions) in accordance with results of GATE investigations of the effects of deep convection on tropical, marine BLs. Dissert. Abstr.

N83-28791 Wisconsin Univ., Madison.
ON THE INTERACTION BETWEEN INERTIA-GRAVITY NORMAL MODES AND GEOSTROPHIC CURRENTS IN A SIMPLE FLUID MODEL Ph.D. Thesis
Richard Alexander Hyde 1982 146 p
Avail: Univ. Microfilms Order No. DA8220873

The interaction between a zonally averaged mean current and an inertia-gravity wave perturbation is examined during the evolution of a geophysical fluid from an initial state of imbalance. The problem is modeled with the shallow water equations confined to a channel on a tangent plane with constant rotation. The nonlinear zonal current (initially geostrophic) and the linear inertia-gravity wave (initially a periodic normal mode of the current) are integrated simultaneously using standard, numerical finite difference techniques. The results indicate that the physics of their interaction can be found alternatively by calculating the inertia-gravity normal mode compatible with the initial geostrophic current and then calculating the current's (steady state) equilibria consistent with the forcing of the nonlinear wave advections. For a variety of currents and for various scales, numerical computations show how stable inertia-gravity normal modes are deformed from their pure Kelvin and pure Poincare structures by the shear and the depth variations of their mean state environments. Dissert. Abstr.

N83-28792 Wisconsin Univ., Madison.
A STUDY OF BIAS AND RANDOM ERROR DISTRIBUTIONS FOR ATMOSPHERIC STRUCTURE AND QUASI-LAGRANGIAN BUDGET STATISTICS Ph.D. Thesis
Robert Edwin Peterson 1982 218 p
Avail: Univ. Microfilms Order No. DA8215960

Bias and random error components are investigated within the framework of objective analysis of atmospheric structure and quasi-Lagrangian diagnostics of mass and kinetic energy. An analytic specification of an extratropical cyclone is used to define a true atmospheric structure and related processes. Synthetic radiosonde data, consisting of true values specified by the analytic structure and additive error components, are created for the irregularly spaced network of the North American observing stations. Fields of meteorological information are objectively analyzed onto a latitude-longitude grid from these synthetic radiosonde observations. A further interpolation to a cyclone centered spherical coordinate system is used for quasi-Lagrangian diagnostics. Bias and random errors are identified by comparing the results of the objective analyses and the quasi-Lagrangian diagnostics with the analytically known structure and processes. Dissert. Abstr.

N83-28793 Colorado Univ., Boulder.
A PHOTOCHEMICAL THERMAL MODEL OF HYDROGEN AND OXYGEN IN THE SUMMER MESOSPHERE AND IMPLICATIONS FOR NOCTILUCENT CLOUD FORMATION Ph.D. Thesis
Christopher McKay 1982 158 p
Avail: Univ. Microfilms Order No. DA8229852

High in the Earth's atmosphere, at an altitude of about 82 km, clouds can be seen in summer near the polar regions. These clouds are only seen in twilight against the background of a clear dark sky, and are known as Noctilucent Clouds. Temperature measurements in this region indicate that this is the coldest place on the planet Earth, with temperatures as low as 135 Kelvin. To investigate the occurence of these low temperatures and the formation of these clouds a one dimensional time-dependent photochemical-thermal numerical model of the atmosphere between 50 and 120 km has been constructed. The model includes the important chemistry of the hydrogen and oxygen species and transport by eddy and molecular processes. Vertical winds, consistent with mass continuity, are calculated from observed two dimensional temperature distributions and incorporated into the one dimensional model. Dissert. Abstr.

N83-28794 Colorado State Univ., Fort Collins.
AN OBSERVATIONAL AND NUMERICAL STUDY OF MOUNTAIN BOUNDARY-LAYER FLOW Ph.D. Thesis
Robert Mason Banta 1982 218 p
Avail: Univ. Microfilms Order No. DA8227908

A combined observational and numerical study of the dissolution of the nocturnal cold air layer, which forms in the lower regions of a mountain basin, and of the effect that this has on the development of local wind systems in the basin is presented. The numerical modeling results were obtained from a dry, two dimensional, fine resolution version of a cloud model. In the observational portion surface mesonet charts and time plots of meteorological data reveal three types of local winds: downslope winds, upslope winds and afternoon winds which correspond in direction with the winds above the ridgetops. Vertical profiles of potential temperature, moisture, and wind accompanying these wind systems were determined from rawinsonde and tethered balloon sounding, and vertical potential temperature cross sections were both inferred and determined from aircraft data. Dissert. Abstr.

N83-28795*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ON EXCITATION OF EARTH'S FREE WOBBLE AND REFERENCE FRAMES
B. Fong Chao May 1983 18 p refs
(NASA-TM-85028; Rept-921; NAS 1.15:85028) Avail: NTIS HC A02/MF A01 CSCL 08E

The excitation of the Earth's polar motion in connection with problems that are associated with the diversity of reference frames involved in observations and theoretical computations is studied. Following the dynamics of the Earth's polar motion, the kinematics that relates observations from different reference frames is developed. The conventional procedures of studying the seismic excitation of polar motion are re-examined, subject to the question: relative to what reference frame? It is concluded that an inconsistency in reference frames has prevailed in the literature. While this inconsistency is indeed far from trivial, the resultant discrepancy, however, is small for all practical purposes. Author

N83-28796*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
SAM 2 MEASUREMENTS OF THE POLAR STRATOSPHERIC AEROSOL. VOLUME 4: APRIL 1980 TO OCTOBER 1980
M. Patrick McCormick and David Brandl (Systems and Applied Sciences Corp., Hampton, Va.) Jun. 1983 78 p refs 4 Vol.
(NASA-RP-1107; L-15625; NAS 1.61:1107) Avail: NTIS HC A05/MF A01 CSCL 04A

The Stratospheric Aerosol Measurement (SAM) 2 sensor is aboard the Nimbus 7 spacecraft providing extinction measurements of the Antarctic and Arctic stratospheric aerosols with a vertical resolution of 1 km. Representative examples and weekly averages of these aerosol data and corresponding temperature profiles are presented. Contours of aerosols extinction as a function of altitude and longitude or time are plotted and weekly aerosol optical depths are calculated. Stratospheric optical depths are 0.002 to 0.003 for the Antarctic and 0.002 to 0.003 at the beginning to 0.005 to 0.006 at the end of the time period for the Arctic. Polar stratospheric clouds at altitudes between the tropopause and 20 km were observed during the Antarctic winter. A ready-to-use format containing a representative sample of the fourth 6 months of data to be used in atmospheric and climatic studies is reported. Author

N83-28797*# Applied Research, Inc., Huntsville, Ala.
ADDED SCOPE: BETA EXPERIMENT Final Report
30 Apr. 1983 139 p
(Contract NAS8-34337)
(NASA-CR-170777; NAS 1.26:170777) Avail: NTIS HC A07/MF A01 CSCL 04A

Beta flight test data analysis, LDV signal processing analysis and simulation, data processing code, and CESTIM, signal processing code are presented. Author

N83-28798# Texas Univ. at Dallas, Richardson.
THE 35TH GASEOUS ELECTRONICS CONFERENCE Final Report, 1 Jul. - 31 Dec. 1982
Carl B. Collins 31 Dec. 1982 129 p Conf. held at Dallas, 19-22 Oct. 1982
(Grant N00014-82-G-0078; NR Proj. 395-038)
(AD-A125765; GEC-82) Avail: NTIS HC A07/MF A01 CSCL 04/1

This conference is sponsored each year by the division of Electron and Atomic Physics of the American Physical Society, and was hosted this year by UTD. One hundred forty-four papers were presented in 19 sessions. Two workshops were held, one devoted to atomic and molecular collisions processes in dense plasmas and the other to chemical processes in planetary atmospheres. GRA

N83-28799# Naval Postgraduate School, Monterey, Calif. Dept. of Systems Technology.
EVALUATION OF GEOMAGNETIC ACTIVITY IN THE MAD FREQUENCY BAND (.04 TO 0.6 Hz) M.S. Thesis
Jeffrey Mark Schweiger Oct. 1982 117 p refs
(AD-A125641) Avail: NTIS HC A06/MF A01 CSCL 17/6

After defining geomagnetic noise as it applies to MAD, the geomagnetic indices currently used by the fleet to predict MAD geomagnetic noise are reviewed to determine their actual applicability. The current indices are determined to be insufficient, methods are proposed for establishing a new MAD index, and a developmental MAD index system was tested. Geomagnetic fluctuations in the .04 to 2.0 Hz frequency band was recorded at Monterey, California, and used for a preliminary test of the proposed MAD index. Author (GRA)

N83-28800# Naval Surface Weapons Center, Dahlgren, Va. Strategic Systems Dept.
EFFECT OF ADDITIONAL ORBIT INCLINATION ON SOLUTION FOR EARTH'S GRAVITY FIELD Final Report
Richard J. Anderle Dec. 1982 38 p
(AD-A125665; NSWC/TR-82-453) Avail: NTIS HC A03/MF A01 CSCL 08/5

An approximate method was developed to determine the optimum inclination at which to launch an additional satellite to improve the determination of the Earth's gravity field from satellite observations. In an example where data was assumed to be available at orbital inclinations of 65 deg, 90 deg, 108 deg, and 115 deg, the optimum inclination of a new satellite was found to be 95 deg although a nearby equivalent could be obtained at inclinations of 85 deg or below 55 deg. GRA

N83-28801# Sandia Labs., Albuquerque, N. Mex.
SANDIA NATIONAL LABORATORIES ASCOT (ATMOSPHERIC STUDIES IN COMPLEX TERRAIN) FIELD EXPERIMENT, SEPTEMBER 1980
R. O. Woods Apr. 1982 23 p refs
(Contract DE-AC04-76DP-00789)
(DE82-015645; SAND-82-0504) Avail: NTIS HC A02/MF A01

During the period September 8 through September 25, 1980, Sandia National Laboratories, Division 4774, participated in a series of experiments held in the Geysers area of California. These experiments, aimed at providing data on nighttime drainage flow in complex terrain, were intended to provide a reliable basis for mathematical fow modeling. Tracers were released at several points on a valley rim and sampled by a large number of stations at ground level. Sandia's contribution was to make it possible to derive vertical tracer profiles. This was done by taking air samples from a captive balloon at chosen altitudes between the surface and 450 meters above ground. DOE

N83-28802# California Univ., Livermore. Lawrence Livermore Lab.
CORRELATION OF ULTRASONIC VELOCITY AND ROCK STRENGTH
Wunan Lin 12 Jan. 1983 22 p refs
(Contract W-7405-eng-48)

(DE83-007355; UCID-19658) Avail: NTIS HC A02/MF A01

Ultimate strength and shear wave velocity of dry, 50% saturated, and saturated Paintbrush tuff samples from the Nevada Test Site (NTS) were measured as a function of pressure. It was found that a linear relationship exists between the ultimate strength (tau) and shear modulus ((SIGMA)) for the dry tuff at pressures from 0.1 to 20 MPa and from 100 to 300 MPa, with values of d tau/d(SIGMA); of about 1.25 x 10(+2) and 2.6 x 10(+2), respectively. At pressures between 20 and 100 MPa a linear relationship also exists with a much greater value of d tau/d (SIGMA), of about 9.9 x 10(+2). For the half saturated tuff, under undrained testing conditions, a similar linear relationship exists at pressures up to 20 MPa. At pressures between 20 and 300 MPa the data of the partially saturated tuff have too much scattering to deduce a meaningful relation. No such correlation are found for the saturated tuff sample under undrained testing conditions. DOE

N83-28803# Los Alamos Scientific Lab., N. Mex.
ANALYSIS OF ALTERNATIVE RESPONSES TO MINING SUBSIDENCE HAZARDS: CURRENT STATUS AND FUTURE DIRECTION
D. A. Rapp, J. M. Greenwood, J. Goetzinger, D. Oberhettinger, and C. A. Stroup Feb. 1982 63 p refs
(Contract W-7405-eng-36)
(DE82-009715; LA-9239-MS) Avail: NTIS HC A04/MF A01

The magnitude and the consequences of the problem throughout the underground mining regions of the US were examined. Such problems have produced a complex array of case laws that have produced a nebulous history of legal interpretations of property rights and adjudication of liability. Seven research activities that are needed to help solve these problems and to evaluate alternative response options are identified. These are: socio-economic impact assessment; data acquisition; instrumentation monitoring techniques; subsidence prediction; subsidence damage prediction; subsidence control and damage abatement; and technology transfer. Each activity category is described in the context of its place in an overall research and development program. The categories are presented in a series of matrices along with specific assessment methods and data required to conduct the research activities. DOE

N83-28804# Los Alamos Scientific Lab., N. Mex.
EXPLOSIVELY PRODUCED FRACTURE OF OIL SHALE Progress Report, Oct. - Dec. 1981
W. A. Morris May 1982 23 p refs
(Contract W-7405-eng-36)
(DE82-016405; LA-9286-PR) Avail: NTIS HC A02/MF A01

Rock fragmentation research in oil shale to develop the blasting technologies and designs required to prepare a rubble bed for a modified in situ retort is reported. Experimental work is outlined, proposed studies in explosive characterization are detailed and progress in numerical calculation techniques to predict fracture of the shale is described. A detailed geologic characterization of two Anvil Points experiment sites is related to previous work at Colony Mine. The second section focuses on computer modeling and theory. The latest generation of the stress wave code SHALE, its three dimensional potential, and the slide line package for it are described. A general stress rate equation that takes energy dependence into account is discussed. DOE

N83-28805# Coupland, Moran and Associates, Albuquerque, N. Mex.
UTILIZATION OF GEOTHERMAL ENERGY-FEASIBILITY STUDY, OJO CALIENTE MINERAL SPRINGS COMPANY, OJO CALIENTE, NEW MEXICO
Apr. 1982 97 p Prepared for Edgerton, Germeshausen and Grier, Inc., Idaho Falls, Idaho
(Contract DE-AC07-76ID-01570)
(DE82-013645; EGG-2149) Avail: NTIS HC A05/MF A01

The feasibility of a geothermal heating system at the Ojo Caliente Mineral Springs Co. was investigated. The geothermal energy will be used to preheat hot water for the laundry facilities and to heat the water for a two pipe fan coil heating system in the hotel. Present annual heating fuel costs of $11,218 for propane will be replaced by electricity to operate fans and pump at an annual cost of $2547, resulting in a net savings of $8671. Installation costs include $10,100 for a well system, $1400 for a laundry system, and $41,100 for a heating system. With the addition of a 10% design fee the total installation cost is $57,860. Ignoring escalating propane fuel prices, tax credits for energy conservation equipment, and potential funding from the State of New Mexico for a geothermal demonstration project, the simple economic payback period for this project is 6.7 years. DOE

N83-28806# Nevada Univ., Reno. Seismological Lab.
SEISMICITY RELATED TO GEOTHERMAL DEVELOPMENT IN DIXIE VALLEY, NEVADA Final Technical Report, 16 Aug. 1979 - 15 Dec. 1981
Alan S. Ryall and Ute R. Vetter 8 Jul. 1982 106 p refs
(Contracts DE-AC08-79NV-10054; DI-14-08-0001-19299)
(DE82-018081; DOE/NV-10054/3; USGS-14-08-0001-19299-2)
Avail: NTIS HC A06/MF A01

A ten-station seismic network was operated in and around the Dixie Valley area from January 1980 to November 1981; three of these stations are still in operation. Data from the Dixie Valley network were analyzed through 30 June 1981, and results of analysis were compared with analysis of somewhat larger events for the period 1970-1979. The seismic cycle in the Western Great Basic, the geologic structural setting, and the instrumentation are also described. DOE

N83-28807# Los Alamos Scientific Lab., N. Mex.
EARTHQUAKE CATALOG FOR NORTHERN NEW MEXICO Progress Report, Jan. - Mar. 1982
D. J. Cash, K. H. Olsen, N. J. McFarland, J. N. Stewart, and J. J. Wolff Feb. 1983 13 p refs
(Contract W-7405-eng-36)
(DE83-009274; LA-9679-PR) Avail: NTIS HC A02/MF A01

This report is a summary of the earthquakes located in northern New Mexico by the Los Alamos National Laboratory seismic array. Data are presented in the form of tables and epicenter maps, with a brief explanatory text. DOE

N83-28808# Utah Univ., Salt Lake City. Earth Science Lab.
SEISMIC BASELINE AND INDUCTION STUDIES: ROOSEVELT HOT SPRINGS, UTAH AND RAFT RIVER, IDAHO Final Technical Report
George Zandt, Louise McPherson, Schyler Schaff, and Steven Olsen May 1982 60 p refs
(Contract DE-AS07-78ID-01821)
(DE83-008990; DOE/ID-01821/T1) Avail: NTIS HC A04/MF A01

Local seismic networks were established to monitor the background seismicity prior to initiation of geothermal power production. The Raft River study area is currently seismically quiet down to the level of approximately magnitude one. The Roosevelt Hot Springs area has low level seismic activity for M/sub L/ greater than about two; however, microearthquake swarms appear to be relatively common. One swarm occurred adjacent to the Roosevelt geothermal area during the summer of 1981. From June 27 to August 28, 1044 microearthquakes were recorded from which 686 earthquakes were located and analyzed. The main cluster of microearthquakes was located about 2 km east of the production field at a depth of about 5 km. A few small events were located in the production field at shallow depths. Three of the four largest earthquakes in the swarm were located 4 to 5 km further east along a n-MW trend beneath the flank of the adjacent Mineral Mountains. Focal mechanism solutions indicate primarily normal faulting due to the regional E-W extension which characterizes this portion of the eastern Basin and Range province. The Mineral Mountain swarm appears to be a natural release of tectonic stress in this area. It is concluded that the occurrence of natural earthquake swarms indicates a potential for induced seismicity at Roosevelt Hot Springs after major production operations are initiated. DOE

N83-28809# California Univ., Livermore. Lawrence Livermore Lab.
SEISMICITY OF THE LIVERMORE VALLEY REGION, 1969 - 1981
James F. Scheimer, Steven R. Taylor, and Madison Sharp 12 Apr. 1982 12 p refs Presented at the Conf. on Earthquake Hazards in the Eastern San Francisco Bay area, Hayward, Calif., 24 Mar. 1982
(Contract W-7405-eng-48)
(DE82-012700; UCRL-86969; CONF-820355-3) Avail: NTIS HC A02/MF A01

In 1979 and 1980, LLNL installed a digitally recorded, event detected seismic network in the Livermore Valley region to augment the existing USGS Calnet stations. The data are routinely processed for P and S arrival times and epicenters are determined on a daily basis. The velocity model used was derived from P wave travel times from 223 well recorded earthquakes and five times explosions which were inverted simultaneously for one and three dimensional velocity structure, station corrections, and hypocenters. Calculated station delays show a good correlation with geologic structure. The three-D inversions allow improved structural determination, but demonstrate little improvement in earthquake locations over the one-D inversion with station corrections. All recorded events from 1969 to 1981 were relocated using the 1-D model. Revised locations for earlier events in the Livermore Valley are closely correlated with seismicity recorded with the new, more dense network. DOE

N83-28810# Argonne National Lab., Ill.
SOME NATURAL ZEOLITES: RECENT THERMODYNAMIC RESULTS, THEIR APPLICATION, AND THE ESTIMATION OF MISSING HERMODYNAMIC QUANTITIES
P. A. G. OHare, G. K. Johnson, H. E. Flotow, and W. S. Wise (California Univ., Santa Barbara) 1982 6 p refs Presented at the 2nd Czech. Conf. on Calorimetry, Prague, 13-17 Sep. 1982
(Contract W-31-109-eng-38)
(DE83-007704; CONF-8209108-1) Avail: NTIS HC A02/MF A01

New calorimetric measurements are reported on the following minerals: analcime, dehydrated analcime, natrolite, scolecite, mesolite, and heulandite. The thermodynamic quantities determined include the standard enthalpy of formation, the high- and low-temperature enthalpy increments, the low-temperature (5 to 350 K) heat capacity, the standard entropy, and the Gibbs energy of formation. The application of calorimetric data to equilibria of geologic interest is demonstrated. DOE

N83-28811# West Virginia Univ., Morgantown. Dept. of Geology and Geography.
SHALLOW SEISMIC INVESTIGATIONS OF DEVONIAN-SHALE GAS PRODUCTION
Richard T. Williams, James E. Ruotsala, John J. Kudla, and William E. Dunne Jun. 1982 218 p refs
(Contract DE-AT21-80MC-14394)
(DE83-008964; DOE/MC-14394/1365) Avail: NTIS HC A10/MF A01

Fractured Devonian shale gas reservoirs which are detectable by seismic reflection methods is discussed. The preferred exploration rationale is based on travel time anomalies related to lowered acoustic velocity within the gas bearing zone. In the simplest case the travel time anomaly causes an apparent down warp or sag in a flat lying reflector. The high resolution extension of the seismic method drew two separate conclusions: (1) additional, valuable subsurface information can be obtained by recording seismic data at frequencies higher than those in common use by the petroleum industry; and (2) it is feasible to obtain seismic reflection data on a smaller scale, using less costly instrumentation, than is typically employed in the petroleum industry. DOE

N83-28812# Terra Tek, Inc., Salt Lake City, Utah.
PHYSICAL PROCESSES OF SUBSIDENCE IN GEOTHERMAL RESERVOIRS
John F. Schatz, Kenneth Wolgemuth, Scott Carlisle, Mark Smith, and Ahmed Abou-Sayed Jun. 1982 151 p refs
(Contract DE-AC03-76SF-00098)
(DE83-011017; LBL-14605; GSRMP-12; TR-82-39) Avail: NTIS HC A08/MF A01

The acquisition of core and fluid from producing geothermal reservoirs was presented. The testing of specimens of this core for their short term and long term compaction response; and the development of a compaction constitutive model that would allow future analysis of reservoir compaction and a surfce subsidence was investigated. Depths and porosities ranged from 3500 to 11,000 feet and 15 to 40, respectively. Several samples of geothermal fluids were also obtained. Selected specimens were tested for their response to the pressures and temperatures of the geothermal environment and to simulated changes in those conditions caused by production. Short term tests indicate that these sedimentary materials behave normally with respect to the expected behavior of reservoir sandstones of these depths and porosities. Compressibilities are of the order 1 x 10(6) psi. Long term tests indicate that pore pressure reduction, simulating reservoir production, tend to cause creep compaction at an initial rate of about 1 x 10(+7) % porosity reduction per second. DOE

N83-28813# California Univ., Livermore. Lawrence Livermore Lab.
A COUPLED MODEL FOR IN-PLANE PROPAGATION OF A FLUID-PRESSURIZED CRACK
M. E. Hanson, L. D. Thorson, and F. E. Heuze Mar. 1983 26 p refs
(Contract W-7405-eng-48)
(DE83-009871; UCID-19754) Avail: NTIS HC A03/MF A01

A numerical model which was developed and implemented on the LLNL computer system, which performs the analysis of the two dimensional fluid pressurized crack propagating in its own plane is described. This model is primarily intended to show the effect of stress barriers on the crack propagation. The external stress perpendicular to the crack extension direction is allowed to vary in space. Other quantities, such as rock mass stiffness, rock mass permeability, and fluid viscosity, can be varied parametrically to provide further insight into the hydraulic fracturing process. DOE

N83-28814# Lamont-Doherty Geological Observatory, Palisades, N. Y.
THE TIME-DEPENDENT TRANSMISSIVITY OF JOINTS Progress Report, 1 Jul. 1982 - 30 Jun. 1983
T. Engelder Feb. 1983 70 p refs
(Contract DE-AC02-76ER-4054)
(DE83-010112; DOE/ER-04054/7; COO-4054-7) Avail: NTIS HC A04/MF A01

The time dependence of joint transmissivity is reported. The report consists of three parts: (1) a review of previous work on fluid flow through joints; (2) a discussion of our study of surface topography of joints; and (3) a review of our fluid flow experiments for the 1982-1983 contract year. DOE

N83-28815# California Univ., Livermore. Lawrence Livermore Lab.
REGIONAL SEISMIC TEST NETWORK SITE DESCRIPTIONS
Steven R. Taylor and Bern J. Qualheim 17 Mar. 1983 81 p refs
(Contract W-7405-eng-48)
(DE83-010180; UCID-19769) Avail: NTIS HC A05/MF A01

The five regional seismic test network sites (RSTN) are described. The sites are characterized for their geological and geophysical setting. The geology section includes a description of the regional geology and an account of the geology in the immediate station vicinity. Stratigraphic columns and geophysical well logs of the seismometer hole are presented. The geophysics section for each site is divided into velocity structure and Q, regional seismicity and tectonics, and noise characteristics. Information is derived from a literature review. Data are analyzed from seismic stations at or near the sites and from preliminary analysis of actual RSTN data. DOE

N83-28816# Nebraska Univ., Lincoln. Inst. of Agriculture and Natural Resources.
DISTRIBUTION OF MINERAL NITROGEN UNDER NATIVE RANGE AND CULTIVATED FIELDS IN THE NEBRASKA SAND-HILLS
Gary W. Hergert 30 Jul. 1982 70 p refs
(PB83-150367; W83-01632; OWRT-A-061-ZNEB(1)) Avail: NTIS HC A04/MF A01 CSCL 08H

Seven different sites were sampled to the water table for soil moisture, nitrate and ammonium content. Three holes per site were taken for averaging the measured parameters over holes by depth. Hole to hole variability at a iven depth was not too large in most instances. Variation was greatest in the upper 12 meters due to soil textural differences caused by shifting of sands in the recent geologic past. The irrigation and N fertilizer application history of each site was documented. Only slight differences between nitrate-N under alfalfa and its adjacent native range were evident. This data can provide a good data base for verification of models used to predict nitrate-N movement under various crops grown on deep, very sandy soil. GRA

47 METEOROLOGY AND CLIMATOLOGY

Includes weather forecasting and modification.

N83-28817 Michigan Univ., Ann Arbor.
CLIMATIC VARIABILITY AROUND THE GREAT LAKES SPECIFIC TO THE PROBLEM OF ICE FORECASTING Ph.D. Thesis
Daniel Wills Gaskill 1982 245 p
Avail: Univ. Microfilms Order No. DA8224954

This dissertation presents a statistical analysis of climatic variability around the Great Lakes region specific to the problem of ice forecasting. The data set used for this research consists of 81 years of mean monthly temperatures, spanning the period from 1897 to 1977, inclusive, at 25 stations around the Great Lakes. Prior to the statistical analysis, these temperature series were subjected to a homogeneity analysis. The homogeneity analysis revealed many inhomogeneities in the temperature series for which correction factors were estimated. These correction factors were applied to the original series in order to approximate homogeneous conditions. Results of the statistical analysis demonstrate that the Great Lakes region is homogeneous with respect to both short and long term fluctuations in air temperature. A simple model, which includes only a regionally average annual harmonic accounts for over ninety percent of the variance in the regional climate. Geographic variation in the long term mean and amplitude of the annual harmonic explains only an additional 4.8 percent of the total variance in these temperature series. Dissert. Abstr.

N83-28818 Washington Univ., Seattle.
THE VARIATION OF THE DRAG COEFFICIENT IN THE MARINE SURFACE LAYER DUE TO TEMPORAL AND SPATIAL VARIATIONS OF THE SURFACE WIND AND SEA STATE Ph.D. Thesis
Hugh Michael Byrne 1982 129 p
Avail: Univ. Microfilms Order No. DA8226527

The neutral atmospheric drag coefficient, C sub dn and ocean surface wave spectra were measured on both sides of a strong atmospheric front. The front was part of a mature extratropical cyclone moving across the Gulf of Alaska. Results showed a large variation in C sub dn at constant mean wind speed in the cold sector which could not be explained by formulations found in the literature. This investigation, which measured the complete one dimensional surface wave spectrum, constitutes the first time wave spectral measurements were made together with eddy correlation flux measurements in the marine surface layer. Coincident wave spectral measurements showed an unexpected increase in energy in the six second wave band (.15 yields .17 hz), which was correlated with the variation of C sub dn. The spatial distribution of wave spectral energy in the duration limited sea behind the front was found to differ markedly from the spatial distribution of wave spectral energy in the fetch limited case. Dissert. Abstr.

N83-28819 Saint Louis Univ., Mo.
A STUDY OF THE KINEMATIC, DYNAMIC AND THERMODYNAMIC FEATURES OF A SEVERE RIGHT-MOVING THUNDERSTORM Ph.D. Thesis
Robert William Pasken 1981 137 p
Avail: Univ. Microfilms Order No. DA8223714

Dual-Doppler wind data at 1423 CST for the 8 June 1974 tornadic storm, obtained from the National Severe Storms Laboratory, were used to test a method for recovering the perturbation pressure and virtual temperature fields from the derived three dimensional wind field. The data were meticulously processed following the procedures discussed by Brown et.al. (1981). The domain of interest had horizontal dimensions of 26 (km) x 26 (km) and a vertical extent of 12 km. The horizontal winds, relative to the storm, were obtained on a grid with 1 km intervals using Barnes' objective analysis scheme. Gridded values of the vertical velocity were computed from the anelastic continuity equation by integrating downward from the storm's top. A variational integral constraint similar to that used by Ray et al. (1980) was used to adjust the computed vertical velocities. No additional filtering other than that inherent in the objective analysis scheme was made. Once the three dimensional wind field at all the analysis levels was obtained, the perturbation pressure fields were computed from the horizontal pressure equation with Neumann boundary conditions using sequential relaxation. Dissert. Abstr.

N83-28820 Wisconsin Univ., Madison.
A ZONAL MONTHLY NORTHERN HEMISPHERE CLIMATE MODEL Ph.D. Thesis
Kelly Thomas Redmond 1982 188 p
Avail: Univ. Microfilms Order No. DA8220892

An energy balance climate model of the Northern Hemisphere is developed. The model climate consists of the set of surface temperatures of 910 deg wide latitude zones for each of the 12 months. The energy budget is that of the atmosphere, with the constraint that the substrate energy flows also balance. Equilibrium at interannual time scales is assumed. The model calculates meridional energy fluxes, solar absorption, infrared fluxes to space and to and from the surface, and storage, in the atmosphere, and storage and radiation absorption in the substrate. A simplified ice budget is included. Turbulent sensible and latent fluxes are a residual of the substrate balance. Land and sea albedoes, ocean temperatures, and atmospheric water vapor are interactive. The model is used to investigate changes in solar constant, orbital geometry, carbon dioxide, and stratospheric dust. An increase in the solar constant by 1% raises the hemispheric annual temperature by 1.35 C, with a rise of 1.1 C in winter and 1.8 C in summer. Dissert. Abstr.

N83-28821 Washington Univ., Seattle.
ON THE ANNUAL AND INTERANNUAL VARIATIONS OF THE TROPICAL PACIFIC ATMOSPHERE AND OCEAN Ph.D. Thesis
John DeWitt Horel 1982 147 p
Avail: Univ. Microfilms Order No. DA8226543

The interannual fluctuations of the atmosphere associated with the El Nino/Southern Oscillation phenomenon are documented. In addition, the annual cycles of sea surface temperature (SST), surface wind, and other atmospheric variables in the tropical Pacific are described. A variety of data sets are used: SST and surface wind measured aboard ships, station reports of sea level pressure (SLP) and rainfall, radiosonde observations of geopotential height and wind from 850 mb to 100 mb, gridded analyses of SLP and 300 mb height in the Northern Hemisphere and gridded analyses of 300 mb wind in the tropics. Warm SST (relative to the annual mean) appears in December and January along the coast of Peru and Ecuador and then spreads westward along the equator during the next several months. The surface winds are convergent on the western flank of the region of warm SST. Dissert. Abstr.

N83-28822 Colorado State Univ., Fort Collins.
REMOTE TROPOSPHERIC SO2: CLOUD TRANSPORT OF REACTIVE SULFUR EMISSIONS Ph.D. Thesis
Robert Bone Chatfield 1982 237 p
Avail: Univ. Microfilms Order No. DA8227914

Model simulations suggest that reactive sulfur gases emitted from the land or ocean surface can produce upper tropospheric sulfur dioxide at the levels of 80 + or - 30 pptv measured over the remote oceans. Emissions of 20-40 Tg(S)/yr of dimethyl sulfide, hydrogen sulfide, carbon disulfide, or more reactive species appear sufficient to explain this SO2. Previously published estimates based on traditional K sub Z theory suggest 1/6 to 1/30 as much SO2 since they do not simulate the effects of rapid, but intermittent, convective transport. Transports due to penetrative cumulonimbus, organized into cloud clusters, are related to a simplified synoptic-scale overturning circulation characteristics of the tropical marine atmosphere. Low clouds and cloud-free regions occupy four-fifths of the area. A two dimensional photochemical model is presented that has consistent descriptions of cloud effects on photolysis rates, transports, and water-phase chemistry. The transports used are based on diagnostic studies of cloud populations in the tropics and subtropics. Dissert. Abstr.

N83-28823*# Saint Louis Univ., Mo. Dept. of Earth and Atmospheric Sciences.
CONTRIBUTIONS OF DIVERGENT AND NONDIVERGENT WINDS TO THE KINETIC ENERGY BALANCE OF A SEVERE STORM ENVIRONMENT Interim Report
Peter A. Browning and Henry E. Fuelberg Washington NASA Jun. 1983 116 p refs
(Contract NAS8-33370)
(NASA-CR-3702; NAS 1.26:3702) Avail: NTIS HC A06/MF A01 CSCL 04B

Divergent and rotational components of the synoptic scale kinetic energy balance are presented using rawinsonde data at 3 and 6 h intervals from the Atmospheric Variability Experiment (AVE 4). Two intense thunderstorm complexes occurred during the period. Energy budgets are described for the entire computational region and for limited volumes that enclose and move with the convection. Although small in magnitude, the divergent wind component played an important role in the cross contour generation and horizontal flux divergence of kinetic energy. The importance of V sub D appears directly to the presence and intensity of convection within the area. Although K sub D usually comprised less than 10 percent of the total kinetic energy content within the storm environment, as much as 87 percent of the total horizontal flux divergence and 68 percent of the total cross contour generation was due to the divergent component in the upper atmosphere. Generation of kinetic energy by the divergent component appears to be a major factor in the creation of an upper level wind maximum on the poleward side of one of the complexes. A random error analysis is presented to assess confidence limits in the various energy parameters. S.L.

N83-28824# Finnish Meteorological Inst., Helsinki.
MEASUREMENTS OF SUNSHINE DURATION 1971 - 1980. METEOROLOGICAL YEARBOOK OF FINLAND, VOLUME 71-80, PART 4:2
Antti Kulmala, ed. 1982 164 p
(ISBN-951-697-186-5; ISSN-0076-6763) Avail: NTIS HC A08/MF A01

The results obtained from the observations of the duration of sunshine made at the Finnish stations during the years 1971-1980 are contained. The geographical coordinates and heights of stations including the installation heights of the instruments and the days when the Sun is below the horizon are listed. The results are presented as the duration of sunshine per day (to the nearest 1/10 hour) for each year and in a summary table per month for the whole period 1971-1980. Author

N83-28825*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
A STUDY OF THE INFLUENCE OF SOIL MOISTURE ON FUTURE PRECIPITATION
Michael J. Fennessy and Y. C. Sud May 1983 130 p refs
(NASA-TM-85042; Rept-911; NAS 1.15:85042) Avail: NTIS HC A07/MF A01 CSCL 04B

Forty years of precipitation and surface temperature data observed over 261 Local Climatic Data (LCD) stations in the Continental United States was utilized in a ground hydrology model to yield soil moisture time series at each station. A month-by-month soil moisture dataset was constructed for each year. The monthly precipitation was correlated with antecedent monthly precipitation, soil moisture and vapotranspiration separately. The maximum positive correlation is found to be in the drought prone western Great Plains region during the latter part of summer. There is also some negative correlation in coastal regions. The correlations between soil moisture and precipitation particularly in the latter part of summer, suggest that large scale droughts over extended periods may be partially maintained by the feedback influence of soil moisture on rainfall. In many other regions the lack of positive correlation shows that there is no simple answer such as higher land-surface evapotranspiration leads to more precipitation, and points out the complexity of the influence of soil moisture on the ensuring precipitation. Author

N83-28826*# Pennsylvania State Univ., University Park. Dept. of Meteorology.
A COMPARATIVE STUDY OF MEASUREMENTS FROM RADIOSONDES, ROCKETSONDES, AND SATELLITES
Mark S. Nestler Mar. 1983 107 p refs
(Contract NAS6-2726)
(NASA-CR-168343; NAS 1.26:168343) Avail: NTIS HC A06/MF A01 CSCL 04B

Direct comparisons of operational products derived from measurements of radiance by satellites to measurements from conventional in situ sensors are important for the evaluation of satellite systems. However, errors in the in situ measurements themselves complicate such comparisons. Atmospheric temporal and spatial variability are also influential. These issues are investigated by means of a special field program composed of flights of dual radiosondes and multiple radiosondes launched near the time of NOAA-6 overpasses. Satellite derived mean layer temperatures, geopotential heights, and winds are compared with the same quantities determined from the in situ sensors. Of particular inerest is the impact of in situ errors on these comparisons. It is shown that the radiosonde provides a precise pressure height relationship and therefore precise data for synoptic type use. Radar tracking of the radiosondes reveals, however, an imprecise pressure measurement which causes large differences between the actual altitude of the radiosonde and the altitude at which it is calculated to be. Radiosondes should be radar tracked and pressures calculated if the data are to be used for purposes other than synoptic use. Evaluation of rocketsonde data reveals a temperature precision of 1 to 2 K below about 55 km. Above 55 km, the precision decreases rapidly; rms differences of up to 11 K are obtained. S.L.

N83-28827# Wisconsin Univ., Madison. Dept. of Electrical and Computer Engineering.
RESTORATION OF MULTICHANNEL MICROWAVE IMAGERY TO ESTIMATE RAINFALL RATES IN HURRICANE
R. T. Chin, C. L. Yeh, W. S. Olson, and J. A. Weinman 1983 5 p refs Presented at the Optical Society of Am. Topical Meeting, 12-14 Jan. 1982, Incline Village, Nev.
Avail: NTIS HC A02/MF A01

The constrainted iterative restoration procedure was demonstrated through computer simulations to be effective in restoring the spatial resolution of all the SMMR channels to a 27 x 18 km footprint. An obvious next step is to apply this procedure to real SMMR data. Author

N83-28828*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
USER'S GUIDE FOR THE SOLAR BACKSCATTERED ULTRAVIOLET (SBUV) AND THE TOTAL OZONE MAPPING SPEC-

TROMETER (TOMS) RUT-S AND RUT-T DATA SETS: OCTOBER 31, 1978 TO NOVEMBER 1, 1980

A. J. Fleig, D. F. Heath, K. F. Klenk (Systems and Applied Sciences Corp., Bladensburg, Md.), N. Oslik (Systems and Applied Sciences Corp., Bladensburg, MD.), K. D. Lee (Systems and Applied Sciences Corp., Bladensburg, Md.), H. Park (Systems and Applied Sciences Corp., Bladensburg, Md.), P. K. Bhartia (Systems and Applied Sciences Corp., Bladensburg, Md.), and D. Gordon (Systems and Applied Sciences Corp., Bladensburg, Md.) Jun. 1983 135 p refs
(Contract NAS5-27393)
(NASA-RP-1112; Rept-910; NAS 1.61:1112) Avail: NTIS HC A07/MF A01 CSCL 04B

Raw data from the Solar Backscattered Ultrviolet/Total Ozone Mapping Spectrometer (SBUV/TOMS) Nimbus 7 operation are available on computer tape. These data are contained on two separate sets of RUTs (Raw Units Tapes) for SBUV and TOMS, labelled RUT-S and RUT-T respectively. The RUT-S and RUT-T tapes contain uncalibrated radiance and irradiance data, housekeeping data, wavelength and electronic calibration data, instrument field-of-view location and solar ephemeris information. These tapes also contain colocated cloud, terrain pressure and snow/ice thickness data, each derived from an independent source. The 'RUT User's Guide' describes the SBUV and TOMS experiments, the instrument calibration and performance, operating schedules, and data coverage, and provides an assessment of RUT-S and -T data quality. It also provides detailed information on the data available on the computer tapes. S.L.

N83-28829# Air Force Geophysics Lab., Hanscom AFB, Mass. Meteorology Div.

A SURVEY OF TECHNIQUES FOR DETERMINING SHORT-DURATION PRECIPITATION RATE STATISTICS Interim Report

Paul Tattelman and Donald D. Grantham 17 Nov. 1982 33 p refs
(AD-A125705; AFGL-TR-82-0357; AFSG-441) Avail: NTIS HC A03/MF A01 CSCL 04/2

A search for information on short-duration precipitation rates uncovered several sources of data, primarily for North America and Europe. However, the data available, especially for 1-min rainfall rates, are insufficient to permit direct calculation of precipitation-rate frequency distributions for all but a few locations in the world. Since these statistics are needed for a variety of applications, researchers developed models that can be used to estimate 1-min rainfall-rate distributions. Some require climatic data, while others divide the globe into regions, each of which is associated with a representative distribution. A survey of the available data and a comparison of models for determining short-duration precipitation rate distributions is presented, with particular emphasis on 1-min rates. Author (GRA)

N83-28830# Du Pont de Nemours (E. I.) and Co., Aiken, S.C.

MICROMETEOROLOGICAL DATA FOR THE ENERGY BALANCE AND EXCHANGE OF CARBON DIOXIDE BETWEEN A FOREST AND THE ATMOSPHERE

C. E. Murphy, Jr. Jun. 1982 109 p refs
(Contract DE-AC09-76SR-00001)
(DE82-019300; DPST-82-447) Avail: NTIS HC A06/MF A01

The data reported was collected to measure the energy balance and carbon dioxide flux of a young pine plantation. The data set consists of half-hour averages of the meteorological parameters. The parameters measured were (1) air temperature, air vapor density, and air carbon dioxide concentration at four levels above the forest; (2) wind speed at five levels above the forest; (3) solar and net radiation above the forest; and (4) soil temperature at four depths below the surface of the soil. The purpose is to make the original data available to other researchers. DOE

N83-28831# Brown Univ., Providence, R. I. Dept. of Geological Sciences.

GLOBAL TEMPERATURE PATTERNS 6000 YEARS AGO Progress Report

Thompson Webb, III Dec. 1982 54 p refs
(Contract DE-AC02-79EV-10097)
(DE83-006815; DOE/V-10097/4) Avail: NTIS HC A04/MF A01

The preparation of a global paleoclimatic data base for 6000 yr B.P. is reported. Computer files exist for pollen, lake-level, and marine plankton data. New data and radiocarbon data from Australia, Alaska, Labrador, and the Indian Ocean were obtained and these are added to the data base. Progress was made in gaining climatic estimates from pollen data in North America and Europe. Maps show the temperature estimates for 6000 yr B.P. from central eastern North America. The estimates for mean annual temperature in this midlatitude area average about 20 C higher than the observed temperatures for today. Global maps are also presented for past lake levels and changes in the lake levels in closed basin lakes. The maps show that the water levels in lakes are lower today than at 6000 yr B.P. for almost all lakes in all regions. These changes are marked in northern Africa, Australia, and southwestern North America. DOE

N83-28832# California Univ., Livermore. Lawrence Livermore Lab.

COMPARISON OF CROSS-PATH OPTICAL ANEMOMETER DATA FROM ASCOT 1979 AND 1980 EXPERIMENTS

William M. Porch, Richard Fritz (NOAA, Boulder, Colo.), Ray Hosker (NOAA, Oak Ridge, Tenn.), and Richard Coulter (Argonne National Lab.) Apr. 1982 38 p refs
(Contract W-7405-eng-48)
(DE82-013517; UCID-19358; ASCOT-82-1) Avail: NTIS HC A03/MF A01

The spatial averaging and sensitivity to low wind speeds associated with optical cross path wind sensing are shown to be valuable assets in complex terrain wind studies. Optical anemometer paths were located across valleys which channel drainage winds. The optical path component perpendicular to the valley stream flow was used to isolate the drainage wind component. The results from these instruments were used to determine the timing, strength and extent of the drainage, morning upslope and afternoon sea breeze winds. These data were also used to determine complex terrain effects on auto-spectral wind variability at a point from a cup vane anemometer and the effect of this variability on numerical wind field models which include spatial averaging. DOE

N83-28833# Missouri Univ., Columbia. Dept. of Atmospheric Science.

ATMOSPHERIC STRUCTURE PRIOR TO TORNADOES AS DERIVED FROM PROXIMITY AND PRECEDENT UPPER-AIR SOUNDINGS COVERING THE PERIOD APRIL 1977 TO JUNE 1979

G. E. Taylor and G. L. Darkow May 1982 107 p refs
(Contract NRC-04-77-055)
(DE82-904674; NUREG/CR-2359) Avail: NTIS MF A06; SOD HC $5.50

The uniqueness of the thermodynamic and dynamic structure of the atmosphere in the area of imminent tornado bearing storm development is analyzed by comparing 115 tornado proximity soundings with upper air soundings made at the same location 6 and 12 hours earlier (precedent soundings) and with soundings made simultaneously at neighboring upper air stations. The comparisons suggest that both the proximity station and the neighboring station upstream with respect to the mean flow in the low level moist air display very similar degrees of hydrostatic and potential-convective instability by late afternoon. The principal difference is in the wind profiles at the two locations. The tornado proximity station displays significantly stronger wind speeds above 1 km with the most striking difference being in the vertical shear of the wind in the layer from 1 to 3 km above ground level. DOE

N83-28834# Royal Netherlands Meteorological Inst., De Bilt.

CLIMATOLOGICAL DATA OF STATIONS IN THE NETHERLANDS. NO. 10: NORMALS AND STANDARD DEVIATIONS FOR THE PERIOD 1951-1980

1982 159 p refs In ENGLISH and DUTCH

(KNMI-150-10) Avail: NTIS HC A08/MF A01

Atmospheric pressure, wind direction and speed, temperature, relative humidity, vapor pressure, global radiation, precipitation and sunshine data are presented. Author (ESA)

N83-28835# Hawaii Univ., Honolulu. Dept. of Meteorology.
ASPECTS OF THE CLIMATOLOGY OF CHINA
Bao Cheng-lan Dec. 1982 81 p refs
(Grant NSF ATM-82-10901)
(PB83-148320; UHMET-82-4) Avail: NTIS HC A05/MF A01 CSCL 04B

In winter, which is cold and dry, the Mongolia-Siberia cold high pressure predominates. It ridge extends southward and controls most of China with frequent cold outbreaks. In spring temperature rises gradually but unevenly. Weather is variable with cyclone activity over the Yangtze-Huaihe River and Northeast China. Usually a rainy period persists over southern China; gales and frequent spring droughts occur over North China. Summer is hot and wet. For the whole country, the rainy season begins in April and ends in September-October. However, a failure of the Mai-yu rainy season and control by the subtropical high can cause a sweltering hot summer and drought with disastrous consequences. Eastern and southern China suffer typhoon strikes in summer. Author (GRA)

N83-28836# National Center for Atmospheric Research, Boulder, Colo.
ATLAS OF SIMULTANEOUS OCCURRENCE OF DIFFERENT CLOUD TYPES OVER THE OCEAN
Carole J. Hahn (Cooperative Inst. for Research in Environmental Science, Boulder, Colo.), Stephen G. Warren (Washington Univ.), Julius London (Colorado Univ., Boulder), Robert M. Chervin, and Roy Jenne Nov. 1982 222 p refs Sponsored in part by NSF
(PB83-152074; NCAR/TN-201) Avail: NTIS HC A10/MF A01 CSCL 04B

Cloud observations from ships are used to investigate the occurrence of different cloud types and the geographical and seasonal variation of these co-occurrences. Ground based observations are used because they provide a more definitive identification of clouds by type than do satellite observations. The clouds are grouped into six types (cirrus type clouds, altostratus + altocumulus, nimbostratus, cumulus, stratus + stratocumulus, and cumulonimbus). These contingency probabilities should be useful for testing cloud generation algorithms in general circulation models and for interpretation of cloud observations from satellites. GRA

N83-28837# National Center for Atmospheric Research, Boulder, Colo.
WEAKLY INHOMOGENEOUS TURBULENCE THEORY WITH APPLICATIONS TO GEOPHYSICAL FLOWS Ph.D. Thesis - MIT. Final Report
Lin Ho 1982 155 p refs Sponsored by NSF
(PB83-152082; NCAR/CT-69) Avail: NTIS HC A08/MF A01 CSCL 04B

The problems of inhomogeneous turbulence are investigated. The main goal was to find the connections between analytic turbulence theories, notably the formalism of the direct interaction approximation (DIA), and turbulence phenomenology. To simplify the results from an inhomogeneous DIA model, a diagonalization procedure was employed and an assumption of weak inhomogeneity. The diagonalization procedure expands the off-diagonal correlations in terms of the diagonal correlations nd the mean shear, and the weakly inhomogeneous assumption assumes a scale separation between the eddies and mean field. As a consequence, the DIA diagonalization process becomes an asymptotic expansion. A simple two dimensional shear flow and a passive tracer flow were considered as practical examples of applications of the theory. GRA

N83-28838# Rocky Mountain Forest and Range Experiment Station, Fort Collins, Colo.
ESTIMATING THE POWER-LAW INDEX FOR WIND Final Report
Willy Z. Sadeh, Yehuda Baron, and Douglas G. Fox 1982 44 p refs
(PB83-152488) Avail: NTIS HC A03/MF A01 CSCL 04B

The reliability of the power law in describing the wind shear above surface roughness under thermally neutral conditions is examined. The method was successfully tested using representative data in flow above very fine, fine, and high surface roughness. GRA

N83-28839# National Severe Storms Lab., Norman, Okla.
MULTIPLE DOPPLER RADAR DERIVED VERTICAL VELOCITIES IN THUNDERSTORMS. PART 1: ERROR ANALYSIS AND SOLUTION TECHNIQUES. PART 2: MAXIMIZING AREAL EXTENT OF VERTICAL VELOCITIES
Oct. 1982 35 p refs
(PB83-152553; NOAA-TM-ERL-NSSL-94; NOAA-82122001) Avail: NTIS HC A03/MF A01 CSCL 04B

A detailed error analysis is performed on the problems associated with using multiple Doppler radar data and the continuity equation to solve for the vertical component of motion in deep convective storms. The errors considered are those due to either incorrect boundary values or errors encountered in integrating the horizontal divergence with height. Data show that errors in the integrated horizontal divergence are much larger than previously thought, indicating the previously ignored effects of bias values may be an important error source. A simple vertical velocity adjustment technique is presented which yields fairly accurate results under most conditions. GRA

N83-28840# National Advisory Committee on Oceans and Atmosphere, Washington, D.C.
FUTURE OF THE NATION'S WEATHER SERVICES. A SPECIAL REPORT TO THE PRESIDENT AND THE CONGRESS
Victoria J. Jones Jul. 1982 83 p refs
(PB83-152793; NACOA-22) Avail: NTIS HC A05/MF A01 CSCL 05A

In this special report to the President and Congress, the National Advisory Committee on Oceans and Atmosphere (NACOA) examines the future of the Nation's civil weather services. NACOA concludes in its report that the weather service functions of data acquisition and basic analysis and forecasting should remain the responsibility of the Federal Government. NACOA stresses that adequate funds be provided to introduce new technologies of data acquisition, processing, and display to increase productivity and improved the effectiveness of weather services. After exploring alternative funding methods for weather services, NACOA concludes that quid pro quo considerations militate against the implementation of user fees, except in special cases. GRA

48 OCEANOGRAPHY

Includes biological, dynamic and physical oceanography; and marine resources.

N83-28841 Oregon State Univ., Corvallis.
ON COASTAL TRAPPED WAVES AT LOW LATITUDES IN A STRATIFIED OCEAN Ph.D. Thesis
Richard Dennis Romea 1983 261 p
Avail: Univ. Microfilms Order No. DA8226266

The response on the continental shelf of a baroclinic ocean to driving by an alongshore coastal wind stress and by barotropic and baroclinic wind forced interior motions is studied as a function of latitude. The relative excitation of continental shelf waves and internal Kelvin waves is studied. The response of a rotating stratified ocean with a vertical boundary, forced at the surface by an alongshore coastal wind stress, shows vertically propagating subinertial motions. Several examples which illustrate the basic properties of the response are presented. Changes in amplitude and frequency with depth are predicted. Components that decay with depth from the surface and components that represent coastal

internal Kelvin waves with negative vertical group velocity and upward phase propagation are forced. The effect of bottom Ekman layer friction and slope topography on free internal kelvin waves is examined, using both a steep and weak slope model. The steep slope represents the low altitude case while the weak slope represents the mid latitude case. There are substantial differences between the results from the two models. Free waves are frictionally damped and offshore and vertical phase shifts are induced by friction, as well as an onshore flow. Dissert. Abstr.

N83-28842 Purdue Univ., Lafayette, Ind.
A STATISTICAL STUDY OF PROCESS-RESPONSE SYSTEMS ON A TIDELESS COAST Ph.D. Thesis
Lee Lindsay Weishar 1982 141 p
Avail: Univ. Microfilms Order No. DA8225785

The tideless Lake Michigan beach and nearshore zone is a highly complex region in which the energy from wind, wind-waves, and longshore current is dissipated. This energy dissipation results in the generation of these process-response systems which produces topographic variations within the beach and nearshore region. A field investigation was conducted to identify and quantify the dominant process-response systems active on a tideless Lake Michigan beach and nearshore one. Three data sets of beach and nearshore bathymetric profile data; long term (order years), annual (order months), short term (order days) were analyzed using the method of empirical eigenfunctions. Analysis of the annual data set results in approximately 95% of the variance being accounted for by the three eigenfunctions with the corresponding three highest eigenvalues. The largest eigenvalue corresponds to an eigenfunction called the mean nearshore-beach function, which represents the mean of the data set and is nearly invariant with time. As a result of this analysis a model has been established which relates long term variations in lake-level to adjustments in the beach and nearshore profile. Dissert. Abstr.

N83-28843*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
RADIO EMISSION SIGNATURE OF SATURN IMMERSIONS IN JUPITER'S MAGNETIC TAIL
Michael D. Desch May 1983 23 p refs
(NASA-TM-85024; NAS 1.15:85024) Avail: NTIS HC A02/MF A01 CSCL 08C

During the interval from about May through August 1981, when Voyager 2 was inbound to Saturn, the Planetary Radio Astronomy instrument measured repeated, dramatic decreases in the intensity of the Saturn Kilometric Radiation (SKR). The emission dropouts averaged two orders of magnitude below mean energy levels and varied from about 1 to 10 Saturn rotations in duration. Comparison with pre-Saturn encounter Voyager 1 observations (June to November, 1980) shows that the SKR dropouts were unique to the Voyager 2 observing interval, consistent with the closer proximity of Saturn to Jupiter's distant magnetotail in 1981. Further, the dropouts occurred on the average at times when Voyager 2 is known to have been within or near Jupiter's magnetic tail.
Author

N83-28844# Western Eco-Systems Technology, Inc., Bothell, Wash.
CHESAPEAKE BAY LOW FRESHWATER INFLOW STUDY. PHASE 2. MAPFOLIO, BIOTA ASSESSMENT Final Report
Gail B. Mackiernan, David F. Bleil, G. Bradford Shea, Joellyn Shea, and Judith McFarland May 1982 222 p
(Contract DACW31-79-C-0056)
(AD-A125154) Avail: NTIS HC A10/MF A01 CSCL 06/6

An assessment of the effects of low freshwater inflow conditions on the biota of Chesapeake Bay was conducted through use of data output from the U.S. Army Corps of Engineers' Chesapeake Bay Hydraulic Model. Four sets of test conditions (scenarios) were used which simulated effects of drought and effects of future consumptive water withdrawal and use as deviations from present average flow conditions. Changes in habitat of over 50 biological organisms were predicted and mapped based on salinity and other variables. Changes in habitat, which were used to delineate the amount of impact from low flow, were found to include increases and decreases depending on the species, its lifecyle, tolerances, and interactions with other organisms. The magnitude of habitat change was found to generally increase as salinity changes increased. Author (GRA)

N83-28845# National Academy of Sciences - National Research Council, Washington, D. C. Marine Board.
MEASURING OCEAN WAVES: PROCEEDINGS OF A SYMPOSIUM AND WORKSHOP ON WAVE-MEASUREMENT TECHNOLOGY
Nov. 1982 259 p refs Workshop held in Washington, 22-24 Apr. 1981
(Grant N00014-82-G-0032)
(AD-A123791) Avail: NTIS HC A12/MF A01 CSCL 08/3

Contents: Operational Needs for Wave Data; Research Needs for Wave Data; Survey of Remote Sensing Techniques for Wave Measurement; Remote Sensing of Ocean Waves by Surface Contour Radar; The Use of Synthetic Aperture Radar (SAR) to Measure Ocean Gravity Waves; Status of HF Radars for Wave-Height Directional Spectral Measurements; Aircraft and Satellite Measurement of Ocean Wave Directional Spectra Using Scanning-Beam Microwave Radars; Review of Wave Measurement Using In Situ Systems; Wave Measurements Using Surface-Mounted Instruments; Pitch-Roll Buoy Wave Directional Spectra Analysis; Subsurface Wave-Measuring Systems; Wave-Measurement Technology in the 1980s; Workshop Sessions. GRA

N83-28846# Alaska Univ., Fairbanks.
ANNUAL SEA ICE. AN AIR-SEA GAS EXCHANGE MODERATOR
T. A. Gosink and J. J. Kelley 1982 19 p refs
(Contract DE-AT06-80EV-10429)
(DE82-013665; DOE/EV-10429/4) Avail: NTIS HC A02/MF A01

Arctic annual sea ice, particularly when it is relatively warm (> -15 C) permits significant gas exchange between the sea and air throughout the entire year. Sea ice, particularly annual sea ice, differs from freshwater ice with respect to its permeability to gases. The presence of brine allows for significant air-sea-ice exchange of CO2 throughout the winter, which may significantly affect the global carbon dioxide balance. Other trace gases are also noted to be enriched in sea ice, but less is known about their importance to air-sea-interactions at this time. Both physical and biological factors cause and modify evolution of gases from the surface of sea ice. Quantitative and qualitative descriptions of the nature and physical behavior of sea ice with respect to brine and gases are discussed. DOE

N83-28847# Alabama Univ., University. Dept. of Engineering Mechanics.
HYDRODYNAMICS OF MOBILE BAY AND MISSISSIPPI SOUND: NET CROSS CHANNEL FLOWS IN MOBILE BAY
Donald C. Raney and John N. Youngblood Oct. 1982 173 p refs
(Contract MASG-R/ER-3; Grant NA81AA-D-00050)
(PB83-155382; MASGP-82-011; NOAA-82122003; BER-285-112)
Avail: NTIS HC A08/MF A01 CSCL 08C

Mobile Bay is located on the northeastern shoreline of the Gulf of Mexico east of the Mississippi River delta. Whether a numerical hydrodynamic model would indicate any tendency to produce circulation patterns consistent with an asymmetric spreading of the dredged material was determined. The sediment transport problem is extremely complex to model properly. The deposition and resuspension process combined with the generally long time frame associated with sediment movement are difficult to represent in a numerical model. As a first approximation to the problem, sediment transport is considered as being related to net fluid transport. A partially calibrated and verified numerical model of Mobile Bay and East Mississippi Sound is applied and net flow rates across the main channel are evaluated. GRA

N83-28848# National Marine Fisheries Service, Woods Hole, Mass. Northeast Fisheries Center.

SUMMARY OF THE PHYSICAL OCEANOGRAPHIC PROCESSES AND FEATURES PERTINENT TO POLLUTION DISTRIBUTION IN THE COASTAL AND OFFSHORE WATERS OF THE NORTHEASTERN UNITED STATES, VIRGINIA TO MAINE
Merton C. Ingham, ed., Reed S. Armstrong, J. Lockwood Chamberlin, Steven K. Cook, David G. Mountain, Ronald J. Schitz, James P. Thomas, James J. Bisagni, John F. Paul, and Catherine E. Warsh Dec. 1982 177 p refs
(PB83-156364; NOAA-TM-NMFS-F/NEC-17) Avail: NTIS HC A09/MF A01 CSCL 08J

Physical processes and features influencing the distribution and fate of pollutants in the coastal and offshore waters of the northeastern United States are described. The general physical oceanographic setting of this portion of the North Atlantic is briefly presented before identifying the following relevant features and processes: estuarine effluent plumes, upwelling, warm core rings and Gulf Stream meanders, fronts, density stratification, the cold pool, bottom currents, and sediment transport. In addition, field measurements of pollutant dispersion and quantitative models and physical processes are discussed. GRA

51 LIFE SCIENCES (GENERAL)

Includes genetics.

N83-28849* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
METHOD FOR DETECTING COLIFORM ORGANISMS Patent
Kenji Nishioka (Boeing Co., Palo Alto, Calif.), David A. Nibley (Boeing Co., Palo Alto, Calif.), Eldon L. Jeffers (Boeing Co., Palo Alto, Calif.), and Richard L. Brooks, inventors (to NASA) (Boeing Co., Palo Alto, Calif.) Issued 31 May 1983 10 p Filed 26 Oct. 1981 Supersedes N82-12739 (20 - 03, p 0386) Sponsored by NASA
(NASA-Case-ARC-11322-1; US-Patent-4,386,157; US-Patent-Appl-SN-315278; US-Patent-Class-435-39; US-Patent-Class-435-3; US-Patent-Class-435-34; US-Patent-Class-435-38; US-Patent-Class-435-807) Avail: US Patent and Trademark Office CSCL 06C

A method and apparatus are disclosed for determining the concentration of coliform bacteria in a sample. The sample containing the coliform bacteria is cultured in a liquid growth medium. The cultured bacteria produce hydrogen and the hydrogen is vented to a second cell containing a buffer solution in which the hydrogen dissolves. By measuring the potential change in the buffer solution caused by the hydrogen, as a function of time, the initial concentration of bacteria in the sample is determined. Alternatively, the potential change in the buffer solution can be compared with the potential change in the liquid growth medium to verify that the potential change in the liquid growth medium is produced primarily by the hydrogen gas produced by the coliform bacteria. Official Gazette of the U.S. Patent and Trademark Office

N83-28850# Defence Research Information Centre, Orpington (England).
THE CONCENTRATION OF COBALT-60 AND STABLE COBALT IN SEDENTARY MARINE ORGANISMS
Yoshiaki Imazawa, Kazunari Nakayama, Joji Abukawa, Hiroko Fukatsu, and Hideo Higuchi Jan. 1983 12 p refs Transl. into ENGLISH from Radioisotopes (Japan), v. 31, no. 1, 1982 p 21-25
(BLL-DRIC-Trans-6755-(3623.66)) Avail: NTIS HC A02/MF A01

The level of Cobalt 60 and stable Cobalt in shellfish and seaweeds collected along the Japaneses coast in 1978 and 1979 was surveyed. Sedentary organisms such as shellfish which concentrate cobalt are valuable indicators in establishing the level of radioactivity. Explanations are given for variations in results for different organisms. Author

N83-28851# Defence Research Information Centre, Orpington (England).
THE CONCENTRATIONS OF COBALT-60 AND STABLE COBALT IN MIGRATORY MARINE ORGANISMS
Hiroko Fukatsu, Kazunari Nakayama, Yoshiaki Imazawa, Joji Abukawa, and Hideo Higuchi Jan. 1983 12 p refs Transl. into ENGLISH from Radioisotopes (Japan), v. 31, Jan. 1982 p 16-20
(BLL-DRIC-Trans-6754-(3623.66); BR86784) Avail: NTIS HC A02/MF A01

A survey of information on the level of cobalt-60 and other radio-nuclides in marine organisms inhabiting Japanese inshore waters is described. Large scale nuclear tests at Bikini Atoll in the 1960s are thought to be the source of these radionuclides. This is confirmed by the relation observed between cobalt-60 and stable cobalt in migratory organisms such as squid. S.L.

N83-28852*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
ELECTRON TRANSPORT IN PARACOCCUS HALODENITRIFICANS AND THE ROLE OF UBIQUINONE
Lawrence I. Hochstein and Sonja E. Cronin Jun. 1983 23 p refs
(NASA-TM-84382; A-9269; NAS 1.15:84382) Avail: NTIS HC A02/MF A01 CSCL 06C

The membrane-bound NADH oxidase of Paracoccus halodenitrificans was inhibited by dicoumarol, 2-n-heptyl-4-hydroxyquinoline-N-oxide (HQNO), and exposure to ultraviolet light (at 366 nm). When the membranes were extracted with n-pentane, NADH oxidase activity was lost. Partial restoration was achieved by adding the ubiquinone fraction extracted from the membranes. Succinate oxidation was not inhibited by dicoumarol or HQNO but was affected by ultraviolet irradiation or n-pentane extraction. However, the addition of the ubiquinone fraction to the n-pentane-extracted membranes did not restore enzyme activity. These observations suggested the reducing equivalents from succinate entered the respiratory chain on the oxygen side of the HQNO-sensitive site and probably did not proceed through a quinone. Author

N83-28853# Los Alamos Scientific Lab., N. Mex.
PROBLEMS AND PROSPECTS IN FUTURE APPLICATIONS OF STABLE ISOTOPES IN THE LIFE SCIENCES AND MEDICINE
C. J. Unkefer and T. E. Walker 1982 13 p refs Presented at Synthesis and Appl. of Isotopically Labeled Compounds, Kansas City, Mo., 6-11 Jun. 1982
(DE82-017358; LA-UR-82-1860; CONF-820666-2) Avail: NTIS HC A02/MF A01

The use of stable isotopes of carbon, oxygen, and nirogen in the life sciences and medicine fueled by the increased availability of the isotopes and isotopically labeled compounds and of instruments for their detection is discussed. Accelerated development of 13C, 15N, and 17 18O is expected in the future to study drug bioavailability, nutrition and body protein economy, viability of organs for transplant, and for noninvasive tests of metabolic diseases and dysfunctions. These accelerated developments depend on continued improvements in nmr and ms instrumentation and in methods for the synthesis of isotopically labeled compounds. The possibilities of biosynthesis for the selective enrichment of natural products, especially amino acids, with 13C are explored. DOE

N83-28854# Nebraska Univ., Lincoln.
BIOCHEMICAL AND PHYSIOLOGICAL CHARACTERIZATION OF HIGHER PLANTS WITH REDUCED PHOTORESPIRATION Progress Report, 25 Mar. 1981 - 1 Mar. 1982
Raymond Chollet 1982 4 p refs
(Contract DE-AC02-81ER-10902)
(DE82-009556; DOE/ER-10902/1) Avail: NTIS HC A02/MF A01

Research progress is reported in the following areas: (1) the possibility that reduced photo-respiration in the crucifer Moricandia arvensis is due to a limited C4-photosynthesis system similar to that in the C3-C4 intermediate Panicum miliodies was critically evaluated; and (2) the reported effects of ploidy on the kinetic and structural properties of RuBPCase isolated from various diploid and tetraploid cultivars of perennial ryegrass were evaluated. DOE

N83-28855# Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Applied Mathematics.
AN EIGENVALUE PROBLEM RELATED TO CELL GROWTH
H. J. A. M. Heijmans Nov. 1982 35 p refs Submitted for publication
(MC-TW-229/82) Avail: NTIS HC A03/MF A01

The eigenvalues of the operator corresponding to the partial differential equation, which describes the evolution of a population reproducing by simple fission, are investigated. The eigenvalue problem is transformed to an integral equation. The theory concerning positive operators on a Banach space is shown to be useful in tackling the transformation. Author (ESA)

N83-28856# Municipal Environmental Research Lab., Cincinnati, Ohio.
CHARACTERIZATION OF UNCLASSIFIED NONFERMENTATIVE GRAM NEGATIVE BACTERIA IN DRINKING WATER
Donald F. Spino 1983 27 p refs
(PB83-152165; EPA-600/D-83-003) Avail: NTIS HC A03/MF A01 CSCL 06M

The group of bacteria most frequently encountered in water distribution systems consists of nonfermentative gram negative rods. Only a small percentage of these bacteria are identifiable using commercially prepared kits or other identification keys because many isolates fail to grow in conventional media used for biochemical characterization. Modified base media were developed and used with specific substrates to detect enzymatic activity. The use of the modified base media combined with a lower incubation temperature allowed expression of increased enzymatic activity by many of the organisms. Although this permitted the characterization of the majority of these organisms, exact identification was unsuccessful since these organisms do not fit descriptions of known species found in current taxonomic schema. GRA

52 AEROSPACE MEDICINE

Includes physiological factors; biological effects of radiation; and weightlessness.

N83-28857 Michigan Univ., Ann Arbor.
PARAMETRIC ANALYSIS OF DYNAMIC POSTURAL REPONSES Ph.D. Thesis
Susan Adair Smeaton Werness 1982 242 p
Avail: Univ. Microfilms Order No. DA8225071

Since human postural control has the dynamic characteristics of a servo mechanism, a potentially useful clinical test is the monitoring and quantification of patient responses to induced disturbances of the base of support. Postural sway is monitored in the sagittal plane by digital line scan cameras sensing silhouette displacement at the waist and shoulders, while the subject stands on a platform capable of linear anterior-posterior translations. Trials are conducted with eyes open and eyes closed. The various stimuli applied to the platform include pseudorandom displacements, which are created by signaling the velocity controlled platform with bandlimited pseudorandom noise. The responses to pseudorandom stimuli of six normal subjects tested under different input amplitude and visual conditions have been quantified by deriving parametric linear systems transfer function plus noise models. Author

N83-28858 Northwestern Univ., Evanston, Ill.
THEORETICAL AND EXPERIMENTAL DETERMINATION OF ARTERIAL PULSE PROPAGATION SPEED Ph.D. Thesis
Steven George Karr 1982 203 p
Avail: Univ. Microfilms Order No. DA8225949

A novel transducer system is described tha permits noninvasive, high fidelity recordings of the pressure-vs-time arterial profile at any palpable site on the body. A thin (30 micron) piezoelectric polymer film of polyvinylidene fluoride serves as the active element and as the mechanical coupler to the skin. The complete system is designed to record four simultaneous profiles on a subject. The noninvasive contours and their first and second derivatives compare well to the simultaneously-recorded intra-arterial pressure pulses. The instrumentation is utilized to determine the pressure pulse-propagation speed, an indirect measure of arterial vessel compliance, from two simultaneously recorded pulse contours. The wave speed determination can be elusive and, therefore, fourteen methods for calculating wave speed are tested using model-generated simulated data. Model data provides a definitive test of the algorithms since the correct value of the wave speed is a known, input parameter. Dissert. Abstr.

N83-28859 Defence Research Information Centre, Orpington (England).
VISUAL PREVENTION OF MOTION SICKNESS IN CARS
T. Probst, S. Krafczyk, W. Buechele, and T. Brandt Jan. 1983 21 p refs Transl. into ENGLISH of Archiv fuer Psychiat. und Nervenkrankheiten (West Germany), v. 231, 1982 p 409-421
(DRIC-T-6823; BR86793) Copyright. Avail: Issuing Activity

The differential effects of vision on motion sickness in cars were tested under real road conditions using linear accelerations, in order to confirm laboratory results on visual modulation of vestibular nausea induced by angular accelerations of the body. The 18 voluntary subjects were exposed to repetitive braking maneuvers (linear accelerations: 01.1 to 1.2 g) on a highway. The simultaneous visual stimulus conditions were: eyes open (visual control of car motion) eyes closed; and artificial stationary visual field (reading). The severity of motion sickness (magnitude estimation 1 to 10) was a function of the visual stimulus condition with significant differences among these conditions: moderate nausea (less tham one) with adequate visual motion perception; medium nausea (about two) with eyes closed and somatosensory-vestibular excitation only; strong nausea (larger than five) with conflicting sensory input, when vestibular acceleration is in disagreement with the visual information of no movement. Providing ample peripheral vision of the relatively moving surroundings is the best strategy to alleviate car sickness. Author (ESA)

N83-28860# School of Aerospace Medicine, Brooks AFB, Tex.
BEHAVIORAL-PERFORMANCE EFFECTS FROM A HIGH-NEUTRON, LOW-GAMMA RADIATION PULSE EXPOSURE Final Report, Jun. - Dec. 1981
G. Carroll Brown, Michael G. Yochmowitz, Kenneth A. Hardy, David Hughes, and Billy Yarbrough Dec. 1982 51 p refs
(AF Proj. 7757)
(AD-A124777; SAM-TR-82-43) Avail: NTIS HC A04/MF A01 CSCL 06/8

A self-paced, 3-light, 3-lever discrete avoidance behavioral task was initiated to study the behavioral performance effects of a high-neutron, low-gamma radiation pulse exposure (550-650 rads, 5.5:1 n/g ratio). Eight rhesus monkey subjects performed the task for 4 hours (3 1/2 hours postexposure). The subjects were monitored daily for 3 days postexposure. For the exposure day only, five subjects had a decrease in correct responses, seven had increased reaction times, and six experienced productive emesis within 3 1/2 hours, although the performance degradations were not severe. An extrapolation to human performance indicates that time-critical tasks (e.g., aircraft landing on a carrier) could be significantly impaired. Author (GRA)

N83-28861# Federal Aviation Administration, Washington, D.C. Office of Aviation Medicine.
REGULATORY AVIATION MEDICINE IT PHILOSPHIES AND LIMITATIONS
Gordon Norwood and Jon L. Jordan Sep. 1982 10 p
(AD-A124043; FAA-AM-82-14) Avail: NTIS HC A02/MF A01 CSCL 06/5

The application of aviation medicine is relatively standardized throughout the world, both in civil and military operations. Substantial differences exist, however, in the way different countries, or even different agencies in the same country, determine the medical qualifications of persons who wish to operate aircraft. As a rule, the medical certification policies of the Federal Aviation Administration (FAA) are more liberal than those imposed by the U.S.

Department of Defense and by many foreign countries. Understanding the reasons for these differences requires an awareness of the characteristics of FAA's regulatory policy. Specifically, we must consider three aspects of that policy: (1) the certification system and its overall effects, (2) the philosophy of medical certification and standards, and (3) the limitations of the system. GRA

N83-28862# Federal Aviation Administration, Washington, D.C. Office of Aviation Medicine.

PHYSIOLOGICAL STRESS IN AIR TRAFFIC CONTROLLERS: A REVIEW

C. E. Melton Aug. 1982 54 p refs

(AD-A123853; FAA-AM-82-17) Avail: NTIS HC A04/MF A01 CSCL 06/19

Ten years of research on physiological stress in air traffic control specialists (ATCS's) is reviewed. Data were derived from 20 tasks involving the experimental variables of workload, shift-rotation patterns, and automation. Laboratories at the Civil Aeromedical Institute consisted of a survey of the quantity and quality of sleep in working ATCS's, a restudy of ATCS's several years after the first study to appraise stress change, and experimental attempts to evoke a differential response to two different qualities of stress. Stress was distinctly related to imposed workload as well as to working conditions. Differences in stress levels in ATCS's on different shift-rotation patterns were minimal. Automation gave rise to increased total stress accounted for by an increased workload incident to the changeover period from annual to computerized control techniques. A stress index was developed to facilitate comparison of physiological stress at the different air traffic control (ATC) facilities and among ATCS's. Anxiety level measurements vary minimally from facility to facility indicating little impact of ATC work on the physchological state of ATC's. These and other measures show that it is clearly inappropriate to describe ATC work, as is commonly done in the popular press, as being unusually stressful. GRA

N83-28863# Federal Aviation Administration, Washington, D.C. Office of Aviation Medicine.

FUNCTIONAL AGING IN PILOTS: AN EXAMINATION OF A MATHEMATICAL MODEL BASED ON MEDICAL DATA ON GENERAL AVIATION PILOTS

James O. Boone Jun. 1982 10 p

(AD-A123756; FAA-AM-82-18) Avail: NTIS HC A02/MF A01 CSCL 06/5

The purpose of this study was to apply mathematical procedures to the Federal Aviation Administration (FAA) pilot medical data to examine the feasibility of devising a linear numbering system such that; (1) the cumulative probability distribution functions (CPDF) for persons who are not diagnosed as having an acute pathology are lower on the scale than those diagnosed as having an acute pathology; and (2) the CPDF's for both groups overlap minimally. The analyses presented some pertinent results: (1) age is not as accurate in discriminating between the sudden incapacitating pathology and nonpathology groups as the linear discriminant composite. (2) As age increases from post-50, to post-55, to post-60, classification using the discriminant index increases monotonically; (3) better measures that predict these pathologies with more accuracy would further separate the CPDF's of the pathology and nonpathology groups. Based of these results a possible strategy for future study on pilot certification is discussed. GRA

N83-28864# Federal Aviation Administration, Washington, D.C. Office of Aviation Medicine.

G INCAPACITATION IN AEROBATIC PILOTS: A FLIGHT HAZARD

William R. Kirkham, S. Marlene Wicks, and D. Lee Lowrey Oct. 1982 35 p refs

(AD-A123757; FAA-AM-82-13) Avail: NTIS HC A03/MF A01 CSCL 06/19

This report presents some historical perspectives of aerobatics and the physiological effects of G acceleration, especially as pertain to in-flight loss of consciousness (LOC) by the pilot. Several accidents and incidents are reviewed to illustrate that LOC occurs in some pilots during aerobatic maneuvers. Accelerometer recordings made during aerobatic performances are analyzed in regard to the G's acting on the pilot during the entire performance and during some specific maneuvers. Human tolerance to G's and specifically to changes from positive to negative G's and vice versa is discussed in regard to some published animal and human studies. This report suggests that oscillating G's as encountered in aerobatics tax the body's mechanisms to maintain blood perfusion of the brain and consciousness. Suggestions are given to help pilots reduce the physiological hazards of G's encountered in aerobatics. Author (GRA)

N83-28865# California Univ., Berkeley. Lawrence Berkeley Lab. Biology and Medicine Div.

HEAVY-ION RADIOGRAPHY AND HEAVY-ION COMPUTED TOPOGRAPHY

Jacob I. Fabrikant, William R. Holley, Eric W. McFarland, and Cornelius A. Tobias Feb. 1982 8 p refs Presented at the 3d Intern. Symp. of the Soc. for Radiological Protection, Inverness, Scotland, 6-11 Jun. 1982

(Contracts DE-AC03-76SF-00098; CA-YO1-CB-40302)

(DE82-012537; LBL-14001; CONF-820613-11) Avail: NTIS HC A02/MF A01

Heavy ion projection and CT radiography is being developed into a safe, low-dose, noninvasive radiological procedure that can quantitate and image small density differences in human tissues. The applications to heavy ion mammography and heavy ion CT imaging of the brain in clinical patients suggest their potential value in cancer diagnosis. DOE

N83-28866# California Univ., Berkeley. Lawrence Berkeley Lab. Biology and Medicine Div.

HEALTH EFFECTS IN WOMEN EXPOSED TO LOW LEVELS OF IONIZING RADIATION

Jacob I. Fabrikant Jun. 1982 27 p refs Presented at the Health Phys. Soc. Ann. Meeting, Las Vegas, Nev., 27 Jun. - 1 Jul. 1982

(Contract W-7405-eng-48)

(DE82-018620; LBL-14198; CONF-820655-4) Avail: NTIS HC A03/MF A01

There are three delayed health effects of radiation which appear at the present time to have importance to women in radiation protection. These are: (1) the probability of cancer induction at low doses and low dose rates; (2) the consideration of those cancers in women, notably the breast and the thyroid, attributable to radiation exposure; and (3) the probability of induction of developmental abnormalities in the newborn following low dose exposure in utero. The bases for the concern over these effects are discussed. DOE

N83-28867# California Univ., Berkeley. Lawrence Berkeley Lab.

DYNAMIC POSITRON-EMISSION TOMOGRAPHY IN MAN USING SMALL BISMUTH GERMANATE CRYSTALS

S. E. Derenzo, T. F. Budinger, R. H. Huesman, and J. L. Cahoon Apr. 1982 14 p refs Presented at 6th Intern. Conf. on Positron Annihilation, Fort Worth, Tex., 3-7 Apr. 1982

(Contract W-7405-eng-48)

(DE82-014997; LBL-14308; CONF-820434-8; CONF-820456-1) Avail: NTIS HC A02/MF A01

Primary considerations for the design of positron emission tomographs for medical studies in humans are the need for high imaging sensitivity, whole organ coverage, good spatial resolution, high maximum data rates, adequate spatial sampling with minimum mechanical motion, shielding against out the plane activity, pulse height discrimination against scattered photons, and timing discrimination against accidental coincidences. The choise of detectors, sampling motion, shielding, and electronics to meet these objectives are discussed. DOE

N83-28868# Fraunhofer-Inst. fuer Toxikologie und Aerosolforschung, Schmallenberg-Grafschaft (West Germany).

INVESTIGATION OF THE TRANSPORT STABILITY OF INHALABLE SYNTHETIC MINERAL FIBERS (GLASS FIBERS, ETC.) IN COMPARISON WITH ASBESTOS Final Report, May 1981
Friedrich Pott, Kvetoslav Spurny, Helmut Opiela, Josef Schoermann, and Gerhard Weiss Bonn Bundesministerium fuer Forschung und Technologie Mar. 1983 194 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-HA-83-003; ISSN-0171-7618) Avail: NTIS HC A09/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 36

A safe composition of synthetic fibers which would not cause a health hazard was investigated. For analysis of small amounts of fibers as well as for analysis of single fibers, analytical transmission electron microscopy, laser-induced mass spectrometry and proton-induced X-ray fluorescence are found to be the most useful methods. Results show that the glass fibers and man made mineral fibers are not resistant to caustic solutions and only partially resistant to acids. In solution they lose alkali and alkali earth elements, and their surface becomes corroded. Glass and other synthetic mineral fibers similar to chrysotile asbestos are instable and after longer exposures in biological environments undergo chemical changes. Author (ESA)

N83-28869# Medical Physics Inst. Utrecht (Netherlands).
[ACTIVITIES REPORT ON MEDICAL RESEARCH IN THE NETHERLANDS] Progress Report, 1982
W. T. vanBeekum, ed., B. vanEijnsbergen, ed., and A. Kamp, ed. Dec. 1980 255 p refs
(PR-8) Avail: NTIS HC A12/MF A01

Brain, heart and lungs, and biomedical instrumentation research is summarized. Topics include: preparation of and measurement in brain slices; EEG monitoring; blood pressure measurement; and external fixator design. Author (ESA)

N83-28870# Wisconsin Univ., Madison. Clinical Science Center.
RESEARCH, DEVELOPMENT AND EVALUATION OF SYSTEMS FOR NON-INVASIVE DETECTION AND QUANTIFICATION OF ATHEROSCLEROTIC LESIONS IN PERIPHERAL AND CORONARY ARTERIES
Charles A. Mistretta and William Zarnstorff Dec. 1982 44 p refs
(Contract N01-HV-12905)
(PB83-157487; NIH-DT-WIS-82) Avail: NTIS HC A03/MF A01 CSCL 06L

Systems for noninvasive detection and quantification of atherosclerotic lesions in peripheral and coronary arteries were studied. Activities in three areas: are summarized (1) investigation of Combined-Energy-Time (Hybrid) Subtraction; (2) construction of a new digital video processor; (3) investigation of various techniques for implementing a digitally controlled beam attenuator. Future directions in each of these areas are described. Author

N83-28012# Joint Publications Research Service, Arlington, Va.
LEONOV DESCRIBES COSMONAUTS' LANDING, PHYSICAL CONDITION
B. Konovalov *In its* USSR Rept.: Space, No. 21 (JPRS-83430) 9 May 1983 p 1-3 refs Transl. into ENGLISH from Nedelya (Moscow), no. 50, 13-19 Dec. 1982 p 5 (For primary document see N83-28011 17-12)
Avail: NTIS HC A07

N83-28018# Joint Publications Research Service, Arlington, Va.
SPACE BIOLOGY AND MEDICINE IN INTERCOSMOS PROGRAM
Ye. I. Vorobyev and A. R. Kotovskaya *In its* USSR Rept.: Space, No. 21 (JPRS-83430) 9 May 1983 p 45-51 Transl. into ENGLISH from Zemlya i Vselennaya (Moscow), no. 2, Mar. - Apr. 1982 p 32-35 (For primary document see N83-28011 17-12)
Avail: NTIS HC A07

53 BEHAVIORAL SCIENCES

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

N83-28871# Johns Hopkins Univ., Baltimore, Md. Div. of Behavioral Biology.
BEHAVIOR ANALYSIS OF CONFINED MICROSOCIETIES IN A PROGRAMMED ENVIRONMENT
Henry H. Emurian and Joseph V. Brady 1 Feb. 1983 55 p refs
(Contract N00014-80-C-0467; NR Proj. 170-910)
(AD-A123878; TR-ONR-7) Avail: NTIS HC A04/MF A01 CSCL 05/1

This report reviews the background, objectives, methodology, and results of a research project devoted to; (1) the development of principles and procedures relevant to the selection and training of sea/space mission personnel; (2) the investigation of preventive monitoring and corrective procedures to enhance sea/space mission performance effectiveness; and (3) the evaluation of countermeasures to the potentially disruptive effects of unfamiliar and stressful environments. Initial research endeavors were directed toward the design and construction of an experimental microsociety environment for continuous residence by small groups of volunteer participants over extended time periods under conditions that provide for performance and recreational opportunities within the context of a biologically and behaviorally supportive setting. Studies were then undertaken to analyze experimentally, conditions that sustain group cohesion and productivity and that prevent social fragmentation and individual performance deterioration, motivational effects produced by the programmed consequences of individual and team performance requirements, and behavioral and biological effects resulting from changes in group size and membership. GRA

N83-28872# Army Aeromedical Research Lab., Fort Rucker, Ala. Biomedical Applications Research Div.
PSYCHOLOGICAL MEASUREMENTS DURING THE WEAR OF THE US AIRCREW CHEMICAL DEFENSE ENSEMBLE Final Report, Jul. 1981 - Jul. 1982
Bruce E. Hamilton and Liliana Zapata Feb. 1983 54 p refs
(DA Proj. 3E1-62777-A-879)
(AD-A125616; USAARL-83-7) Avail: NTIS HC A04/MF A01 CSCL 06/17

The psychological (as opposed to physiological) effects of wearing a US aircrew chemical defense ensemble were evaluated using 12 male and 12 female volunteers. Half of the males and half of the females wore chemical defense ensembles while the rest wore standard US flight suits as controls. All subjects were administered tests of cognition (math, logical reasoning, target detection, and reaction time) before and after 6 hours of wear in a controlled environment. In addition, subjects rated their mood before and after wear. It was concluded that wearing the ensemble in an undemanding environment degraded affect (mood and activation levels), slightly decreased accuracy, and substantially decreased reaction times, especially in females. The most serious impact of the ensemble would seem to be a decrease in morale among females. Author (GRA)

54 MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human engineering; biotechnology; and space suits and protective clothing.

N83-28873 Wisconsin Univ., Madison.
DEVELOPMENT OF AN AUTOMATED GUIDANCE AND DYNAMIC MEASUREMENT SYSTEM FOR COORDINATE MEASURING MACHINES AND ROBOTIC DEVICES Ph.D. Thesis
Kam Chiu Lau 1981 246 p

Avail: Univ. Microfilms Order No. DA8220881

Recent advances in manufacturing technologies have created the need for a modern and sophisticated system to inspect the geometries of various parts produced for both quality and process control. The development of computer-controlled universal coordinate measuring systems (CMS) is a solution to this demand. This dissertation deals with the development of an automatic tactile sensing guidance and dynamic measurement system for coordinating measuring machines and robotic devices. The key to the success of the guidance and dynamic measurement schemes is the ability of the schemes to evaluate the frictional effect between the probe and the part during tracing. Once computed, the frictional effect is used to compensate for the probe measurement to obtain the actual point of contact between the probe and the part. An experimental system is developed to implement the 2 dimensional tracing and measurement theories. Dissert. Abstr.

N83-28874 Defence Research Information Centre, Orpington (England).

THE EFFECTS OF HEARING PROTECTORS ON THE PERCEPTION OF ACOUSTIC SIGNALS

H. Lazarus Feb. 1983 23 p refs Transl. into ENGLISH of Zentr. fuer Airbeitsmed. (West Germany), v. 30, no. 6, 1980 p 204-212

(DRIC-T-6786; BR87062) Copyright. Avail: Issuing Activity

Auditory signal recognition in high noise environments using hearing protectors is studied. The effects of noise spectra and protector frequency response are discussed. The greater the change in sound attenuation per octave of a heaving protector, the higher the loss of audibility through this hearing protector. It is shown that the audibility of signals may improve. The selection of hearing protectors is discussed, concluding that different types should be made available so that each subject can select the type which he subjectively finds least distributing. Author (ESA)

N83-28875# California Univ., Livermore. Lawrence Livermore Lab.

ENVIRONMENTAL TESTING OF ESCAPE BREATHING APPARATUS

Jerry W. Stengel 3 May 1982 9 p refs Presented at the 12th Intersoc. Conf. on Environ. Systems, San Diego, Calif., 19 Aug. 1982

(Contract W-7405-eng-48)

(DE82-014139; UCRL-87580; CONF-820813-1) Avail: NTIS HC A02/MF A01

A new generation of 60 minute self contained breathing apparatus was introduced into the underground coal mining industry for use as respiratory protection during fires and mine disasters. Little field experience existed from which to predict the survivability of this new life support equipment. A series of environmental tests was proposed consisting of exposure to heat, cold, shock, and vibration. Treated and untreated apparatus were evaluated and compared by use on human subjects and a mechanical breathing simulator. Results are reported. After field data were collected, information may be correlated with environmental testing and used as a predictor of survivability. DOE

N83-28876# General Electric Co., St. Petersburg, Fla. Neutron Devices Dept.

CLEAN-ROOM ROBOT IMPLEMENTATION

J. L. Comeau 14 Jul. 1982 31 p

(Contract DE-AC04-76DP-00656)

(DE82-016309; GEPP-TIS-663) Avail: NTIS HC A03/MF A01

A robot was incorporated in a clean room operation in which vacuum tube parts are cleaned just prior to final assembly with a 60 lb/sq in. blast of argon gas. The robot is programmed to pick up the parts, manipulate/rotate them as necessary in the jet pattern and deposit them in a tray precleaned by the robot. A carefully studied implementation plan was followed in the procurement, installation, modification and programming of the robot facility. An unusual configuration of one tube part required a unique gripper design. A study indicated that the tube parts processed by the robot are 12% cleaner than those manually cleaned by an experienced operator. DOE

55 PLANETARY BIOLOGY

Includes exobiology; and extraterrestrial life.

N83-28020# Joint Publications Research Service, Arlington, Va.

ACADEMICIAN TROITSKIY ON SEARCH FOR EXTRATERRESTRIAL INTELLIGENCE

In its USSR Rept.: Space, No. 21 (JPRS-83430) 9 May 1983 p 74-77 refs Transl. into ENGLISH from Leningr. Pravda (Leningrad), 2 Nov. 1982 p 3 (For primary document see N83-28011 17-12)

Avail: NTIS HC A07

59 MATHEMATICAL AND COMPUTER SCIENCES (GENERAL)

N83-28877*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

DECISION-MAKING AND PROBLEM-SOLVING METHODS IN AUTOMATION TECHNOLOGY

Walter W. Hankins, Jack E. Pennington, and L. Keith Barker May 1983 46 p refs

(NASA-TM-83216; NAS 1.15:83216) Avail: NTIS HC A03/MF A01 CSCL 12A

The state of the art in the automation of decision making and problem solving is reviewed. The information upon which the report is based was derived from literature searches, visits to university and government laboratories performing basic research in the area, and a 1980 Langley Research Center sponsored conferences on the subject. It is the contention of the authors that the technology in this area is being generated by research primarily in the three disciplines of Artificial Intelligence, Control Theory, and Operations Research. Under the assumption that the state of the art in decision making and problem solving is reflected in the problems being solved, specific problems and methods of their solution are often discussed to elucidate particular aspects of the subject. Synopses of the following major topic areas comprise most of the report: (1) detection and recognition; (2) planning; and scheduling; (3) learning; (4) theorem proving; (5) distributed systems; (6) knowledge bases; (7) search; (8) heuristics; and (9) evolutionary programming. Author

N83-28878*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

ENTROPY FUNCTIONS FOR SYMMETRIC SYSTEMS OF CONSERVATION LAWS Final Report

Eitan Tadmor Jun. 1983 10 p refs

(Contract NAS1-17070)

(NASA-CR-172139; Rept-83-16; NAS 1.26:172139) Avail: NTIS HC A02/MF A01 CSCL 12A

It is shown that symmetric systems of conservation laws are equipped with a one-parameter family of entropy functions. A simple symmetrizability criterion is used. Author

N83-28879*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

MODELING OF FLEXIBLE SURFACES: A PRELIMINARY STUDY Final Report

H. T. Banks (Brown Univ., Providence) and G. Majda (Brown Univ., Providence) Jun. 1983 26 p refs

(Contracts NAS1-15810; NAS1-16394; Grants NAG1-258; AF-AFOSR-0198-81)

(NASA-CR-172147; NAS 1.26:172147; ICASE-83-19) Avail: NTIS HC A03/MF A01 CSCL 12A

The one-dimensional classical scalar string equation which involves linearization about a horizontal reference or equilibrium position is derived. We then derive a model for small motion about a nonhorizontal reference. The implications of our findings to modeling of flexible antenna surfaces such as that in the Maypole Hoop/Column antenna are discussed. Author

60 COMPUTER OPERATIONS AND HARDWARE

Includes computer graphics and data processing.

For components see *33 Electronics and Electrical Engineering.*

N83-28880 Florida Inst. of Tech., Melbourne.
MICROPROCESSORS: A GENERAL REENTERANT CHIP LEVEL SIMULATION MODEL Ph.D. Thesis
Onyema Eleazer Uzomaka 1982 310 p
Avail: Univ. Microfilms Order No. DA8225109

The data bus, address bus and the program execution control lines such as Read/Write, Interrupt, Reset and the slow device Ready line are signal interface lines that are common to all microprocessor controlled systems. The universality of this specification suggests the development of a general chip-level simulation model that is applicable to a wide range of microprocessors. A chip-level simulation model that presents the microprocessor as a simple multi-output element, will facilitate the simulation of microprocessors in conjunction with other logic elements in an integrated system. This research effort presents a novel design methodology and implementation techniques for the simulation of microprocessors at the chip-level. It is found that the Interface Signal Compatibility Criteria developed herein greatly reduces the number of essential instructions in the representative set, and generally facilitates the selection process by making possible the generation of an Instruction Covering Table and the subsequent use of the Row Dominance technique. Dissert. Abstr.

N83-28881 California Univ., Los Angeles.
QUERY OPTIMIZATION IN DISTRIBUTED DATABASE SYSTEMS Ph.D. Thesis
Paul Joseph Hurley 1982 105 p
Avail: Univ. Microfilms Order No. DA8225588

A model is developed for determining the optimal policy for processing a given relational model query. The model is based on operating cost (processing cost and communication cost), which is a function of selection of sites for processing query operations, sequence of operations, file size, and data reduction functions. The optimal policy specifies the site selection and sequence of operations that yield minimum operating cost. The query is first decomposed into a set of relational algebra operations whose precedence relationships are expressed as a query tree. Additional query trees may be generated by permuting these operations. A set of query processing graphs is then generated for a given query tree. Each node of a query processing graph represents the execution of a set of operations at a single site. Since the neighboring nodes represent distinct processing sites, the arcs between nodes represent the communication cost among sites. Theorems based on the cost model and the query processing graphs are developed for determining the optimal sites for processing the operations and for selecting the local optimal graphs from the set of query processing graphs. The relationship of the query optimization and the file allocation problems is investigated. Dissert. Abstr.

N83-28882 California Univ., Los Angeles.
EVALUATION AND RELIABILITY ESTIMATION OF DISTRIBUTED ARCHITECTURES FOR ON-BOARD COMPUTERS Ph.D. Thesis
Alderico Rodrigues dePaula, Jr. 1982 297 p
Avail: Univ. Microfilms Order No. DA8229665

Spacecraft for future missions are expected to have a high degree of autonomy and to operate for five to ten years without external repair. Consequently, they require computing systems with large computational power and fault tolerance ability to perform self repair. The study of the implementation of distributed processing systems on-board autonomous satellites is examined. The distributed processing architecture was selected because of its high computation power, the ability to be adapted easily for a variety of on-board processing requirements and especially due to its potential robustness in recovering from internal faults. A formulation to estimate the reliability of a multilevel redundant subsystem composed of a group of active and spare modules is developed. This formulation is applied to subsystems having modules which have arbitrary failure rates due to the use of redundancy within modules, or due to the use of components that have non-constant failure rates. Dissert. Abstr.

N83-28883 Princeton Univ., N. J.
AN OPTIMISTIC PROTOCOL FOR PARTITIONED DISTRIBUTED DATABASE SYSTEMS Ph.D. Thesis
Susan B. Davidson 1982 133 p
Avail: Univ. Microfilms Order No. DA8228180

A protocol for transaction processing during partition failures is presented which guarantees mutual consistency between copies of data items after repair is completed. The protocol is 'optimistic' in that transactions are processed without restrictions during the failure; conflicts are detected at repair time using a precedence graph and are resolved by backing out transactions according to some backout strategy. The protocol is then evaluated using simulation and probabilistic modeling. In the simulation, several parameters are varied such as the number of transactions processed in a group, the type of transactions processed, the number of data items present in the database, and the distribution of references to data items. From these results conditions under which the protocol performs well, i.e. conditions under which the protocol backs out a small percentage of the transaction run are noted. A probabilistic model is developed to estimate the expected number of transactions backed out using most of the above database and transaction parameters. Dissert. Abstr.

N83-28884 Royal Aircraft Establishment, Farnborough (England).
MODIFICATION OF SAVANT TO RUN ON THE PDP RSX-11M OPERATING SYSTEM
R. J. Bluff and P. T. May 15 Jan. 1982 102 p refs
(RAE-TM-FS(F)-452; BR85532) Copyright. Avail: Issuing Activity

The alterations and modifications of the system architecture verification and analysis technique (SAVANT) computer program to enable it to be used on a PDP II RSX-11M operating system instead of a Prime 300 computer system are described. The technique of partitioning a large program into several individual segments which are then compiled separately and installed into a library proved to be a worthwhile feature. Even when both machines have Coral compilers the transfer is shown to be a time consuming exercice. After some weeks of running of PDP it is not yet possible to guarantee that the program is free from error. Author (ESA)

N83-28885 National Physical Lab., Teddington (England). Div. of Information Technology and Computing.
A NOTE ON THE ACCURACY OF TWO MICROPROCESSORS
B. A. Wichmann Feb. 1983 25 p refs
(NPL-DITC-18/83; ISSN-0262-5369) Copyright. Avail: Issuing Activity

An analysis was performed of the accuracy of the mathematical functions in the BASIC monitor of the ZX81 and BBC microprocessors. The tests used for this are part of PASCAL validation suite. Changes had to be made from the FORTRAN version for the Pascal validation suite, for instance, to remove the error tests from the accuracy tests. The results of these shows that even the smallest of microprocessors can be expected to give mathematically sound values for the standard functions. Author (ESA)

N83-28886# Naval Postgraduate School, Monterey, Calif.
AN INVESTIGATION OF THE FEASIBILITY OF IMPLEMENTING

SUBSTANTIAL FINITE ELEMENT CODES ON POPULAR MICROCOMPUTERS M.S. Thesis
David Joseph Mulholland Oct. 1982 288 p refs
(AD-A125629) Avail: NTIS HC A13/MF A01 CSCL 09/2

The size and cost of microcomputers continue to decrease while their memory capacity and execution speed increase. These advances should result in small, inexpensive machines attaining the same computing power as current mainframe models. The interim need is to adapt general finite element codes to present day, less capable microcomputers. This thesis explores the program structure, memory management, input/output procedures and equation solving methods necessary to accomplish that task. The equation solving capacity and speed of the Apple-II Plus Personal Computer System and the Hewlett-Packard System 45(A) Desktop Computer are compared. A finite element program for the static analysis of space trusses is presented, as adapted to and tested on the Apple-II Plus. The program output may be printed in either English or French. Author (GRA)

N83-28887# Washington State Univ., Pullman. Dept. of Computer Sciences.
DIGITAL DISKS
Chul E. Kim College Park, Md. Maryland Univ. Sep. 1982 23 p refs Prepared in cooperation with Maryland Univ., College Park (Grants AF-AFOSR-3271-77; NSF ECS-82-00868; AF Proj. 2304)
(AD-A125675; TR-1216; AFOSR-83-0064TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

Geometric properties of digital disks are discussed. An algorithm is presented that determines whether or not a given digital region is a digital disk. Author (GRA)

N83-28888# Los Alamos Scientific Lab., N. Mex.
PARALLEL PROCESSING A LARGE SCIENTIFIC PROBLEM
Robert Hiromoto 1982 17 p refs Presented at the Natl. Computer Conf., Houston, Tex., 7 Jun. 1982
(Contract W-7405-eng-36)
(DE82-008174; LA-UR-82-456; CONF-820606-2) Avail: NTIS HC A02/MF A01

A parallel-processing experiment is discussed that uses a particle-in-cell (PIC) code to study the feasibility of doing large-scale scientific calculations on multiple-processor architecture. A multithread version of this Los Alamos PIC code was successfully implemented and timed on a UNIVAC System 1100/80 computer. Use of a single copy of the instruction stream, and common memory to hold data, eliminated data transmission between processors. The multiple-processing algorithm exploits the PIC code's high degree of large, independent tasks, as well as the configuration of the UNIVAC System 1100/80. Timing results for the multithread version of the PIC code using one, two, three, and four identical processors are given and are shown to have promising speedup times when compared to the overall run times measured for a single-thread version of the PIC code. DOE

N83-28889# Edgerton, Germeshausen and Grier, Inc., Idaho Falls, Idaho. Scientific Information Div.
COMPUTER CONFIGURATION MANAGEMENT FOR SCIENTIFIC MINI-COMPUTERS
J. E. Baston 1982 20 p Presented at the Soc. of Women Engr. Ann. Meeting, Dearborn, Mich., 17 Jun. 1982
(Contract DE-AC07-76ID-01570)
(DE82-018887; EGG-M-10882; CONF-820689-2) Avail: NTIS HC A02/MF A01

A computer configuration management system for scientific mini-computers was developed. The goal of this system is to assure the ability to produce and maintain cost-effective, quality mini-computer systems for data acquisition and reduction in an environment of changing requirements, mobile personnel, and rapidly advancing technology. DOE

N83-28890# National Bureau of Standards, Washington, D.C.
COMPUTER SCIENCE AND TECHNOLOGY: THE SELECTION OF LOCAL AREA COMPUTER NETWORKS Final Report
Robert Rosenthal Nov. 1982 136 p refs Prepared in cooperation with Sytek, Inc.
(PB83-150458; NBS/SP-500-96; LC-82-600635) Avail: NTIS HC A07/MF A01 CSCL 09B

These guidelines present features available in contemporary local area computer networks including distinctions between network applications, topology, protocol architecture and transmission media. Guidance is given to identify the installation's needs. These needs are described in terms of network reliability, traffic characterizations, expected growth, and maintenance requirements. GRA

61 COMPUTER PROGRAMMING AND SOFTWARE

Includes computer programs, routines, and algorithms.

N83-28891 California Univ., Los Angeles.
THE INTEGRATED LOCAL NETWORK Ph.D. Thesis
Pinhas Ziv 1982 271 p
Avail: Univ. Microfilms Order No. DA8225619

An integrated local area network access algorithm is proposed and analyzed. The network users environment is composed of two user classes defined as: guaranteed delay (GD) users, and non-guaranteed delay (NGD) users. In order to satisfy the diversity of service requirements presented by the GD users and NGD users a token reservation ring access protocol is suggested. Mathematical modeling and simulation experiments are used in order to evaluate the performance of the user classes under variable network load conditions. An investigation of the access protocol robustness is carried out and suggestions for recovery mechanisms are presented. Dissert. Abstr.

N83-28892 National Physical Lab., Teddington (England). Div. of Information Technology and Computing.
RELIABLE COMPUTATION OF THE ABERRATION FUNCTION REPRESENTING AN INTERFERENCE PATTERN OF A LENS
P. E. M. Curtis and M. G. Cox Dec. 1982 13 p refs
(NPL-DITC-7/82; ISSN-0262-5369) Copyright. Avail: Issuing Activity

A computational method is described for obtaining measures of lens attributes from interference fringe patterns. The method overcomes the numerical difficulties encountered in a direct fit of the traditional form of the lens aberration function. Lens data are processed the HP 9825. Typical data sets have 100 to 150 points, and some more than 200 points. Numerical results are given for a circular lens pupil whose interference fringe pattern has radial symmetry. In this case measurements were taken only along a single diameter, and the Chebyshev form of the aberration function, together with a tilt term, was used to fit the data, which consists of 24 points. Computed Chebyshev coefficients, for $p = 5$, the tilt coefficient, and the fringe numbers computed for comparison with the data values are quoted. Author (ESA)

N83-28893 National Physical Lab., Teddington (England). Div. of Information Technology and Computing.
A SPEECH CONTROLLED INFORMATION-RETRIEVAL SYSTEM
M. P. Cooke Jan. 1983 18 p refs
(NPL-DITC-15/83; ISSN-0262-5369) Copyright. Avail: Issuing Activity

Word Identification in Speech by Phonetic Analysis (WISPA), software is discussed. It is a research tool developed to evaluate various strategies for the recognition of continuously spoken speech. Although intended primarily for research, WISPA provides an interface through which an application program can send commands and receive messages. The primary aim in creating the information retrieval application was to provide a demonstration of speech recognition for two open days in the Division of Information Technology and Computing. The demonstration afforded an opportunity to investigate the problem of recognising speech from a large population without the possibility of training

the system for each speaker. The system was demonstrated to many different speakers with varying degrees of computer experience. Attention was given to producing a sensible, intelligent man-machine interface, which is described. Author (ESA)

N83-28894 National Physical Lab., Teddington (England). Div. of Information Technology and Computing.
A MESSAGE AUTHENTICATOR ALGORITHM SUITABLE FOR A MAIN FRAME COMPUTER
D. W. Davies and D. O. Clayden Feb. 1983 23 p
(NPL-DITC-17/83; ISSN-0262-5369) Copyright. Avail: Issuing Activity

A 32 bits authenticator system is described. The algorithm by which the authenticator is calculated is specified. Test examples are given with which an implementation can be tested, first in parts, then as a whole. The algorithm can be implemented in a computer with a word length of 32 bits or more. The original design purpose was to remove weaknesses found in the early versions. The test length is not regarded as sufficient for complete safety. Author (ESA)

N83-28895 National Physical Lab., Teddington (England). Div. of Information Technology and Computing.
AN INTRODUCTION AND HANDBOOK FOR THE STANDARD SYNTACTIC METALANGUAGE
R. S. Scowen Feb. 1983 31 p
(NPL-DITC-19/83; ISSN-0262-5369) Copyright. Avail: Issuing Activity

What a metalanguage is and why it is useful is explained. A guide and summary of the British standard BS6154 metalanguage are presented. Many examples are taken from subjects outside computing, others come from FORTRAN or PASCAL. Important features of the standard metalanguage are that it can be typed easily and processed by computers. Author (ESA)

N83-28896 Royal Signals and Radar Establishment, Malvern (England).
DATA VERIFICATION PROGRAMS FOR THE RSRE E-BEAM DATA FORMAT
B. C. Merrifield Jan. 1983 26 p refs
(RSRE-MEMO-3550; BR87379) Copyright. Avail: Issuing Activity

Fortran programs designed to verify data produced for Electron Beam Lithography Machine (EBLM-1) are described. Data files intended for exposure by EBLM-1 can be input to any of the programs depending on the level of verification required. Output is hard copy on a Servogor 281 Digital plotter or visual on a DEC VT125 graphics terminal. The programs provide means of checking complex data structures before committing valuable machine time and materials. Author (ESA)

N83-28897*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE LHEA PDP 11/70 GRAPHICS PROCESSING FACILITY USERS GUIDE
Jul. 1978 146 p
(NASA-TM-79584; NAS 1.15:79584) Avail: NTIS HC A07/MF A01 CSCL 09B

A compilation of all necessary and useful information needed to allow the inexperienced user to program on the PDP 11/70. Information regarding the use of editing and file manipulation utilities as well as operational procedures are included. The inexperienced user is taken through the process of creating, editing, compiling, task building and debugging his/her FORTRAN program. Also, documentation on additional software is included. Author

N83-28898# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
A SYNTAX-DIRECTED PROGRAMMING ENVIRONMENT FOR THE ADA PROGRAMMING LANGUAGE M.S. Thesis
Scott E. Ferguson Dec. 1982 115 p refs
(AD-A124843; AFIT/GCS/MA/82D-1) Avail: NTIS HC A06/MF A01 CSCL 09/2

This document describes the design and implementation of a programming support environment for the Ada language based on a syntax-directed editor and a program tree structure. Though the prototype compiler is limited to a small subset, the full Ada language is supported by the remainder of the environment. Most of the environment is driven by a language syntax description, and is therefore capable of processing virtually any programming language. The prototype syntax-directed environment demonstrates the ability to reduce programmer idle time during development by eliminating parsing and lexical analysis in the compiler. The program tree structure also allows for the development of superior programming environment tools. Author (GRA)

N83-28899# Maryland Univ., College Park. Computer Vision Lab.
TOP-DOWN CELLULAR PYRAMIDS
Angela Y. Wu (American Univ., Washington, D.C.) and Azriel Rosenfeld Jul. 1982 20 p refs
(Grant AF-AFOSR-0065-83; AF Proj. 2304)
(AD-A125588; TR-1191; AFOSR-83-0065TR) Avail: NTIS HC A02/MF A01 CSCL 09/2

A cellular pyramid is an exponentially tapering stack of arrays of processors ('cells'), where each cell is connected to its neighbors ('siblings') on its own level, to a 'parent' on the level above, and to its 'children' on the level below. It is shown that in some situations, if information flows top-down only, from fathers to sons, then a cellular pyramid may be no faster than a one-level cellular array; but it may be possible to use simpler cells in the pyramid case. Author (GRA)

N83-28900# General Dynamics Corp., Fort Worth, Tex.
INTERACTIVE COMPUTER PROGRAM DEVELOPMENT SYSTEM STUDY, VOLUME 1 Final Report, 6 Jan. 1981 - 30 Sep. 1982
H. C. Conn, Jr., D. J. Rodjak, M. A. Goode, R. M. Bond, C. G. Anderson, and R. C. Robertson Griffiss AFB, N.Y. RADC Jan. 1983 447 p refs 3 Vol.
(Contract F30602-81-C-0039; AF Proj. 3205)
(AD-A125626; RADC-TR-83-2-Vol-1; DMA-2-014-Vol-1) Avail: NTIS HC A19/MF A01 CSCL 09/2

This volume describes the development of the design and supporting documentation for an incremental and evolving integrated modern engineering software production environment for the Defense Mapping Agency. The objectives of this study were: To identify DMA needs for a Modern Programming Environment; To forumulate a total systems concept to satisfy the identified needs; To survey and evaluate software tool candidates for the Modern Programming Environment; and to specify a Modern Programming Environment and an implementation plan that satisfies DMA needs. GRA

N83-28901# General Dynamics Corp., Fort Worth, Tex.
INTERACTIVE COMPUTER PROGRAM DEVELOPMENT SYSTEM STUDY. VOLUME 2: SYSTEM/SUBSYSTEM SPECIFICATION Final Report, 6 Jan. 1981 - 30 Sep. 1982
H. C. Conn, Jr., D. J. Rodjak, M. A. Good, R. M. Bond, C. G. Anderson, and R. C. Robertson Griffiss AFB, N.Y. RADC Jan. 1983 55 p 3 Vol.
(Contract F30602-81-C-0039; AF Proj. 3205)
(AD-A125627; DMA-2-014-Vol-2; ARADC-TR-83-3-Vol-2) Avail: NTIS HC A04/MF A01 CSCL 09/2

The purpose of this document is to provide a technical description of the components of the recommended near-term DMA modern programming environment (MPE). This document includes descriptions of the DMA MPE tool bearing host (TBH) and software life cycle tool support environment for the near-term MPE configuration. The tools described are the one which best satisfied the requirements and constraints of the DMA environment at the time this document was produced. The implementation of this system should have the recommended tools or equivalent tools which satisfy the criteria and constraints of the DMA MPE. Only the FORTRAN and COBOL languages are addressed in this document. GRA

N83-28902# General Dynamics Corp., Fort Worth, Tex.
INTERACTIVE COMPUTER PROGRAM DEVELOPMENT SYSTEM STUDY. VOLUME 3: FUNCTIONAL DESCRIPTION Final Report, 6 Jan. 1981 - 30 Sep. 1982
H. C. Conn, Jr., D. J. Rodjak, M. A. Goode, R. M. Bond, and C. G. Anderson Griffiss AFB, N.Y. RADC Jan. 1983 32 p 3 Vol.
(Contract F30602-81-C-0039; AF Proj. 3205)
(AD-A125628; DMA-2-014-Vol-3; RADC-TR-83-3-Vol-3) Avail: NTIS HC A03/MF A01 CSCL 09/2

This Functional Description for the Defense Mapping Agency's Interactive Computer Program Development System Study (ICPDSS) is written to provide the system requirements of the Near-Term Modern Programming Environment (MPE). This will serve as a basis for mutual understanding between the user and developer, as well as information on preliminary design and user impacts. The description presented is generic in nature. Each of DMA's centers will have duplicates of the system described. GRA

N83-28903# Naval Postgraduate School, Monterey, Calif.
A VIEW OF OBJECT-ORIENTED PROGRAMMING
Bruce J. MacLennan Feb. 1983 61 p refs
(Contract N00014-83-WR-20162; RR0000110)
(AD-A125690; NPS52-83-001) Avail: NTIS HC A04/MF A01 CSCL 09/2

Applicative programming languages and languages for data-flow machines are often described as value-oriented languages. Other languages, such a Smalltalk, are described as object-oriented. LISP has been described as both value-oriented and object-oriented. What exactly do these terms mean? This paper attempts to identify and clarify the differences between values and objects and, hence, between value-oriented and object-oriented languages. The paper then turns to the question of whether objects should be included in applicative languages and the role they can fill in those languages. The remainder of the paper is a proposal for one approach to a true object-oriented programming. This includes both an informal description of object-oriented programming constructs and a formal semantics for these constructs. Nondeterminacy, synchronization and recovery from failures are briefly discussed. Author (GRA)

N83-28904# Naval Postgraduate School, Monterey, Calif.
DEVELOPMENT OF A CONCURRENT TREE SEARCH PROGRAM M.S. Thesis
Curt Nelson Powley Oct. 1982 168 p refs
(AD-A125647) Avail: NTIS HC A08/MF A01 CSCL 09/2

Search, especially tree search, is fundamental to the field of artificial intelligence. Even with good heuristic functions, the time it takes on a single processor to solve progressively more difficult tree search problems grows exponentially and quickly becomes constraining. It seems reasonable that the use of concurrency should significantly improve the speed of a tree search. After discussing concurrent programming issues as background, this thesis outlines some high-level approaches to concurrent tree search. Development of each high-level approach includes development of required operating system interfaces. With the warning that choosing the best approach requires empirical evaluation, a concurrent tree search algorithm for the eight-puzzle is presented. Author (GRA)

N83-28905# Naval Academy, Annapolis, Md. Dept. of Physics.
COMPUTER MODELING OF SIMPLE POINT DEFECTS IN RARE EARTH DOPED ALKALINE EARTH FLUORIDES Interim Technical Report
John J. Fontanella and Mary C. Wintersgill 1 Jul. 1982 63 p refs Submitted for publication
(Contract N00014-82-AF-00001; NR Proj. 627-793)
(AD-A125611; TR-4) Avail: NTIS HC A04/MF A01 CSCL 09/2

The results of a package of FORTRAN computer programs for modeling defects in ionic crystals and for fitting experimental data are described. The fundamental concept of the defect simulation is similar to HADES except that the minimization procedure is different since the package is designed to run on small computers. As an example of the use of this package, the relative stabilities of nn and nnn complexes for various rare earths, lanthanum, and yttrium are considered. GRA

N83-28906# Bendix Corp., Kansas City, Mo.
BRUTE
N. C. Christensen May 1982 15 p refs Presented at the Natl. Computer Graphics Assoc. Conf., Anaheim, Calif., 13-17 Jun. 1982
(Contract DE-AC04-76DP-00613)
(DE82-017018; BDX-613-2764; CONF-820649-1) Avail: NTIS HC A02/MF A01

BRUTE is an algorithm to derive the implied boundary of a piecepart from the part's wireframe representation. BRUTE's input is an IGES file. The geometry is extracted and used to derive the edge-vertex (EV) topology. BRUTE then uses a divide-and-conquer method to derive all reasonable face-edge-vertex (FEV) topologies from the EV topology. The final step is to determine the geometry of each face by using the geometry of its edges. Any FEV topology that contains a face that is not a valid surface type is rejected. Valid surface types are plane, cylinder, cone, and sphere. DOE

N83-28907# Oak Ridge National Lab., Tenn. Transportation Energy Group.
DATA-BASED SIMULATOR FOR PREDICTING VEHICLE FUEL COMSUMPTION
Axel B. Rose, John N. Hooker, Glenn F. Roberts, and Jeffrey Hodgson (Tennessee Univ., Knoxville) 1982 40 p refs Presented at the Soc. of Automotive Engr. Intern. Congr. and Exposition, Detroit, 22 Feb. 1982
(Contract W-7405-eng-26)
(DE82-011524; CONF-820203-4) Avail: NTIS HC A03/MF A01

A hybrid system, combining on-road testing and statistical modeling, was developed which permits calculation of a vehicle's fuel consumption over any driving cycle. An instrumentation system permits collection of the necessary on-road and laboratory test data within a relatively short period of time and, once calibrated the model requires considerably less CPU time for execution than engineering simulation models while providing results within 5% of on-road measured fuel uses. The model was run in conjunction with optimization routines for deriving minimum fuel use strategies for a variety of common driving maneuvers. Results for a 1979 Ford Fairmont wagon are given. DOE

N83-28908# Oak Ridge National Lab., Tenn.
ORNL COMPUTERIZED TEXT-MANAGEMENT SYSTEM: STRUCTURE AND CODING SCHEMES
Craig Whitmire, Jr. and James David Mason 1982 7 p Presented at the Meeting of DOE Publications Managers, Washington, D.C., 1 Jan. 1982
(Contract W-7405-eng-26)
(DE82-009632; CONF-820147-1) Avail: NTIS HC A02/MF A01

Our basic system has the essential elements of most typesetting systems: a minicomputer, video-display terminals (VDTs), a photoypesetter, and programs to tie all these together. In our case, the computer is DPD-11/70 from Digital Equipment Corporation. The VDTs are supplied by the source of our primary programs, Interactive Systems Corporation. The phototypesetter is an APS-u5 from Autologic. The typesetting programs are included in IN-compose, a part of the Interactive System/One (IS/1) operating system. IS/1 is itself a commercial version of the UNIX operating system developed at Bell Laboratories. DOE

N83-28909# Oak Ridge Gaseous Diffusion Plant, Tenn. Computer Sciences Div.
OASIS: A COBOL-11 MENU-DRIVEN INFORMATION SYSTEM
W. F. Lee, Jr. 1982 8 p refs Presented at the Spring DECUS Symp., Atlanta, 10-14 May 1982
(Contract W-7405-eng-26)
(DE82-013196; K/CSD-INF-81/32; CONF-820515-3) Avail: NTIS HC A02/MF A01

Oak Ridge National Laboratory's Automated Safeguards Information System (OASIS) is a near real-time nuclear materials/precious metals safeguard and accountability control system.

Using COBOL and RSTS/E on a dedicated 11/34, the system performs on-line inventory update, inquiry and report functions. Processed transactions consisting of intra-laboratory movements, on-site receipts and off-site shipments are maintained for inquiry and report preparation. A secure, controlled but friendly user environment is maintained by chaining between menu and data manipulation tasks. The use of menus, security and access control, screen manipulation, file access and contention, word processing activities, task size problems and other aspects of this application will be discussed. DOE

N83-28910# Sandia Labs., Livermore, Calif.
FORTRAN: COMPUTER-CODE PACKAGE FOR THE EVALUATION OF GAS-PHASE VISCOSITIES, CONDUCTIVITIES, AND DIFFUSION COEFFICIENTS
R. J. Kee, J. Warnatz, and J. A. Miller Mar. 1983 37 p refs
(Contract DE-AC04-76DP-00789)
(DE83-009358; SAND-83-8209) Avail: NTIS HC A03/MF A01

A FORTRAN computer-code package is described that is used for the evaluation of viscosities, thermal conductivities, diffusion coefficients, and thermal diffusion ratios. The package is in two parts. The first computes polynomial fits to the temperature dependent parts of the properties. The coefficients of these fits are passed to a subroutine package via a linking file. Then, any subroutine from library of subroutines may be called to return either pure species properties or gas mixture properties. The fitting procedure significantly increases the computational efficiency of the subroutine package, yet typically it degrades accuracy by less than one percent. This package uses the chemical kinetics package CHEMKIN, and transport properties subroutines are designed to be used in conjunction with the CHEMKIN subroutine library. DOE

N83-28911# Pacific Northwest Lab., Richland, Wash. Statistics Sect.
USE OF COLOR AND MOTION TO DISPLAY HIGHER DIMENSIONAL DATA
Wesley L. Nicholson and Richard J. Littlefield Apr. 1982 21 p refs Presented at the Natl. Computer Graphics Assoc. Conf., Anaheim, Calif., 13-16 Jun. 1982
(Contract DE-AC06-76RL-01830)
(DE82-018775; PNL-SA-10071; CONF-820649-2) Avail: NTIS HC A02/MF A01

Investigation of complex data structure is difficult within the confines of classical statistics. Advances in graphics hardware and software technology transfer can help overcome this deficiency. The Analysis of Large Data Sets (ALDS) Project utilizes a VAX/780 and a RAMTEK 9400 high resolution color graphics scope to investigate the use of color, glyphs and motion to create pseudo higher-dimensions. ALDS integrates this display capability into a flexible data management/statistical analysis software system. Examples show the simultaneous use of color, glyphs and motion to glimpse complex structure of multivariate large data collections. Motion is an excellent higher dimension cue. Glyphs and color must be carefully selected. DOE

N83-28912# Sandia Labs., Albuquerque, N. Mex.
STATISTICAL METHODS FOR UNCERTAINTY ANALYSIS AND SENSITIVITY ASSOCIATED WITH COMPUTER MODELS
Ronald L. Iman 1982 12 p refs Presented at the Waste Management Conf., Tucson, Ariz., 8 Mar. 1982
(Contract DE-AC04-76DP-00789)
(DE82-007831; SAND-82-0315C; CONF-820303-4) Avail: NTIS HC A02/MF A01

A computer model for a physical process produces a time dependent output Z based on a particular selection of input values X/sub 1/, ..., X/sub k/. For the case considered herein it is required to make a number of computer runs n and use these results to estimate the distribution function for the output Z and to quantify the uncertainty as reflected by this distribution function due to variation in the input. It is also important to assess the influence of the input variables and determine which are dominant. Earmarks of such computer models for physical processes are complexity both in terms of the number of input variables and the level of mathematics. The complexity of the mathematics (usually a series of differential equations) precludes a simple analytic solution of identification of the important or dominant variables. Also, the large number of input variables and the long periods of time which the models span act together to greatly increase the amount of computer time required to make a single run of the computer model. These requirements impose some limitations on the number of computer runs that can be made and therefore a judicious selection of specific values of input variables is necessitated. DOE

N83-28913# Research Inst. of National Defence, Stockholm (Sweden).
RESEARCH INSTITUTE OF NATIONAL DEFENCE (FOA) CONFERENCE ON COMPUTER PROCESSING OF GEOGRAPHICAL INFORMATION [FOA KONFERENS OM DATABEHANDLING AV GEOGRAFISK INFORMATION]
Marjorie Nilsson and Anders Wellving Feb. 1982 65 p refs In SWEDISH Held at Stockholm, 29 Oct. 1981
(FOA-C-20442-D8(A3)) Avail: NTIS HC A04/MF A01

Radar data, image processing of spaceborne photographs and seismologic detection are outlined. Color coding is mentioned. Soil mapping for studying electromagnetic wave transmission is described and examples are given. Data acquisition, equipment, and methods to be applied for the different schemes are discussed. Author (ESA)

N83-28914# Little (Arthur D.) International, Inc., Wiesbaden (West Germany).
THE DEVELOPMENT OF DATA PROCESSING IN THE FEDERAL REPUBLIC OF GERMANY. EVALUATION OF THE ELECTRONIC DATA PROCESSING (EDP) SUPPORT PROGRAM OF THE BMFT (1967-1979) Final Report, Jun. 1982
Tom Sommerlatte, Ian Walsh, Dirk Beckerhoff (SRI International, Bonn), Knuth Stelter (SRI International, Bonn), and Ingwelde Klekottka (SRI International, Bonn) Bonn Bundesministerium fuer Forschung und Technologie Dec. 1982 305 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-DV-82-004; ISSN-0170-9011) Avail: NTIS HC A14/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 47

The EDP support program of the German Federal Government, 1967 to 1979 is assessed. The aim of this program was to create a viable German EDP industry and to further EDP applications in private industry, public administration and sciences. The evaluation shows that there are substantial positive results, but the aims of the EDP support program are only partially met. German-based EDP suppliers do not yet hold a sufficient position in the international markets and the necessary interaction of EDP and telecommunications systems and strategies is not yet achieved. Public support is required if the German-based EDP suppliers are to remain or become internationally competitive. Support given to business strategies of the companies rather than only to technology development projects advocated. Author (ESA)

N83-28915# Research Inst. of National Defence, Stockholm (Sweden). Dept. 2.
A SUBSET OF GKS IN ADA
Bernt Andersson and Peter Soederquist Mar. 1983 94 p refs
(FOA-C-20486-D8(E3)) Avail: NTIS HC A05/MF A01

The implementation of a subset of the lowest GKS (Graphical Kernel System) level in the programming language ADA is presented. The GKS is intended as a standard system for computer generated graphics. It is divided into nine levels to adapt the capacity of the system to the requirements. The graphical hardware is presented to the appliation program in the form of an abstract workstation, which is the central conception of GKS. The data structure of the implementation, type declarations, the workstation description table, the error and file handling and the coordinate transformations are included. Author (ESA)

N83-28916# Federal Compiler Testing Center, Falls Church, Va. Office of Software Development.
MICROSOFT INCORPORATED, ZENITH DATA SYSTEMS, Z80, COBOL-80 VERSION 4.63 COBOL Technical Report
31 Aug. 1982 13 p
(PB83-150714; OSD/FSTC-82/177) Avail: NTIS HC A02/MF A01 CSCL 09B

This FCTC Technical Report for the MICROSOFT INC., Microsoft COBOL-80 V4.63 running under the Digital Research CP/M 80 provides a consolidated summary of the results obtained from the evaluation of the subject compiler against the indexed I-O, Level 1 of the 1974 COBOL Standard (X3.23-1974/FIPS PUB 21-1). This technical report is made up of several sections showing all the descrepancies found, if any. A companion report Validation Summary Report OSD/FSTC-82/175 provides information regarding the validation of the compiler as the Low Intermediate level of Federal Standard COBOL (FIPS PUB 21-1). GRA

N83-28917# Federal Compiler Testing Center, Falls Church, Va. Office of Software Development.
CONVERSION WORK PACKAGES Final Report
Jul. 1982 58 p refs
(PB83-156273; OSD/FCSC-82/002) Avail: NTIS HC A04/MF A01 CSCL 09B

Conversion work packages are sets of information on application software (programs, files, job control languages, screen formats, etc.) which are grouped into logical units of work and which will be controlled and converted as a single work unit. Included in conversion work packages are such elements necessary to effect a code translation as program descriptions, source and code listings, test data and plans, and file descriptions. For application program conversion, the conversion work package functions as the basic planning, scheduling, and physical conversion unit. It is essential that the software and file inventory be properly divided into conversion work packages and that managerial controls are established to ensure the successfully conversion of the application programs. Because application program conversion usually constitutes the single largest conversion effort, a detailed discussion with samples of applicable documentation are provided for program work packages. GRA

N83-28918# Environmental Protection Agency, Research Triangle Park, N.C. Environmental Monitoring Systems Lab.
CREATING AND DOCUMENTING PROCEDURES: LETTING GEORGE DO IT
Lynn H. Wright 1983 9 p
(PB83-156778; EPA-600/D-83-006) Avail: NTIS HC A02/MF A01 CSCL 09B

A method of creating and documenting automated data processing routines for the Finnigan INCOS gas chromatograph/mass spectrometer data system is described. A computer program in the form of a set of macroinstructions for the data system text editor is used to automatically convert a file written in a documentation format into executable procedures. An example of use of the program in the generation of automated procedures is given. GRA

N83-28027*# Jet Propulsion Lab., California Inst. of Tech., Pasadena. Communication System Research Sect.
SIMPLIFIED SYNDROME DECODING OF (n, 1) CONVOLUTIONAL CODES
I. S. Reed (Univ. of Southern California) and T. K. Truong *In its* The Telecommun. and Data Acquisition Rept. 15 May 1983 p 15-21 refs (For primary document see N83-28025 17-12)
Avail: NTIS HC A09/MF A01 CSCL 09B

N83-28031*# Jet Propulsion Lab., California Inst. of Tech., Pasadena. Communications Systems Research Sect.
ROOT LOCUS ALGORITHMS FOR PROGRAMMABLE POCKET CALCULATORS
E. R. Wechsler *In its* The Telecommun. and Data Acquisition Rept. 15 May 1983 p 60-64 refs (For primary document see N83-28025 17-12)
Avail: NTIS HC A09/MF A01 CSCL 09B

62 COMPUTER SYSTEMS

Includes computer networks.

N83-28919 California Univ., Berkeley.
TECHNIQUES FOR THE DESIGN AND MANAGEMENT OF DYNAMIC COMPUTER NETWORKS Ph.D. Thesis
Yuen-wah Ma 1981 159 p
Avail: Univ. Microfilms Order No. DA8212027

A dynamic computer network is a computer network in which the sites of the nodes (host computers), the physical connections among the nodes, and the communication paths among the nodes can all be varied with respect to time and space. The study of dynamic computer networks is motivated by the decreasing cost and size of hardware components which have made the installation of a computer network in multiple mobile units (such as aircrafts, human beings, and automobiles) feasible. Adaptability, reconfigurability and efficiency are the key concepts in the design of dynamic networks. Research has involved investigation of the design and management issues of dynamic computer networks, examining the evolution of dynamic computer networks, the characteristics of dynamic computer networks, routing control, and reconfiguration such systems. The characteristics of dynamic computer networks are analyzed based on a classification of communication subnetworks for distributed computer systems. Dissert. Abstr.

N83-28920 Maryland Univ., College Park.
MULTIPLE MICROPROCESSOR SYSTEMS: REPRESENTATION, STRUCTURE, AND APPLICATION Ph.D. Thesis
Robert Louis Martino 1982 210 p
Avail: Univ. Microfilms Order No. DA8226487

Tools for modeling and analyzing multiple microprocessor systems using timed place-transition (P-T) nets are developed. Four special nodes are introduced and important relationships for net variables from net structure are derived. A method is presented to evaluate the performance of such systems using timed P-T nets. This method is used to model and analyze the bus arbitration techniques that occur in multiple microprocessor systems. The techniques were modeled with five modeling cases. Important upper bounds on the average time a microprocessor waits for the bus and the average time the shared bus in not used were derived. A state variable P-T net model of the interconnection of two or more microprocessors and input and output devices is presented. This model provides a framework for determining the avoidance of deadlock and the maintenance of throughput in multiple microprocessor systems. A multiple microprocessor structure that allows simultaneous parallel and pipeline processing of data is proposed. A system for the processing of 24 hour recordings of the ambulatory electrocardiogram and ambulatory pulse wave signals is developed using this structure. Dissert. Abstr.

N83-28921*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
PARALLEL, ASYNCHRONOUS EXECUTIVE (PAX): SYSTEM CONCEPTS, FACILITIES, AND ARCHITECTURE
William H. Jones Jun. 1983 60 p ref
(NASA-TP-2179; E-1584; NAS 1.60:2179) Avail: NTIS HC A04/MF A01 CSCL 09B

The Parallel, Asynchronous Executive (PAX) is a software operating system simulation that allows many computers to work on a single problem at the same time. PAX is currently implemented on a UNIVAC 1100/42 computer system. Independent UNIVAC runstreams are used to simulate independent computers. Data are shared among independent UNIVAC runstreams through shared mass-storage files. PAX has achieved the following: (1) applied several computing processes simultaneously to a single, logically unified problem; (2) resolved most parallel processor conflicts by careful work assignment; (3) resolved by means of worker requests to PAX all conflicts not resolved by work assignment; (4) provided fault isolation and recovery mechanisms to meet the problems of an actual parallel, asynchronous processing machine. Additionally, one real-life problem has been constructed for the PAX environment. This is CASPER, a collection of aerodynamic and structural

dynamic problem simulation routines. CASPER is not discussed in this report except to provide examples of parallel-processing techniques. Author

N83-28922# Los Alamos Scientific Lab., N. Mex.
PERFORMANCE MODELING IN THE DESIGN PROCESS
William Alexander and Richard Brice 1982 21 p refs Presented at the Natl. Computer Conf., Houston, Tex., 7 Jun. 1982
(Contract W-7405-eng-36)
(DE82-004357; LA-UR-81-3502; CONF-820606-1) Avail: NTIS HC A02/MF A01

Performance modeling and analysis of computer systems is often ignored during the project design phase in favor of other techniques collectively known as structured design or software engineering. Benefits that can result from including performance analysis as an integral part of the design process are described. Several different goals timeframes, and roles played by performance analysis during system design are illustrated by three case studies of current projects at Los Alamos. DOE

N83-28923# Sandia Labs., Albuquerque, N. Mex. Computer Communications Design Div.
IMPLEMENTATION OF A TERMINAL SWITCHING NETWORK SUPERVISOR: SAURON, AN INTERACTIVE EXTENSION OF PACX IV CONTROL TECHNIQUES
M. O. Vahle and L. F. Tolendino Apr. 1982 23 p refs
(Contract DE-AC04-76DP-00789)
(DE82-015666; SAND-82-0506) Avail: NTIS HC A02/MF A01

The rapidly growing number of interactive terminals at Sandia National Laboratories which compete for a limited number of computer ports has given rise to the development of a Terminal Switching Network. This paper describes a minicomputer-based supervisory node which interacts with the switches comprising the network and the operations. The supervisor amplifiers the control capabilities of the operators, provides a realtime display of the system status, and records usage statistics. DOE

N83-28924# Physics Lab. RVO-TNO, The Hague (Netherlands).
NETWORK SIMULATION MODEL
B. J. Schilstra Dec. 1982 55 p
(Contract A79/KM/112)
(PhL-1982-66; TDCK-77307) Avail: NTIS HC A04/MF A01

A simulation program which facilitates the construction of networks of databuses and processors in a multiprocessor multitask system is presented. The program components are described including tasks, containing a set of related algorithms, processors, executing the task algorithms, messages, containing data produced by tasks, and databuses. Optional simulation tools which facilitate modelling of concurrent processes are presented. Alternative configurations of processor databuses, supported by the program, are discussed. Author (ESA)

63 CYBERNETICS

Includes feedback and control theory.

For related information see also *54 Man/System Technology and Life Support.*

N83-28925*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
ON THE CONTROL CANONICAL STRUCTURE OF A CLASS OF SCALAR INPUT SYSTEMS Final Report
Russell Teglas Jun. 1983 39 p refs
(Contract NAS1-15810; Grant AF-AFOSR-0018-79)
(NASA-CR-172140; Rept-83-18; NAS 1.26:172140) Avail: NTIS HC A03/MF A01 CSCL 09B

A discrete finite dimensional system, nonharmonic Fourier series and controllability, reduction to canonical form, and spectral synthesis are considered. The extent to which the eigenvalue associated with a controllable pair of a certain type may be modified via continuous linear state feedback is demonstrated. Author

N83-28926# Technische Hogeschool, Delft (Netherlands). Lab. for Measurement and Control.
THE USE OF STRUCTURAL PROPERTIES IN LINEAR MULTIVARIABLE CONTROL SYSTEM DESIGN
A. J. J. vanderWeiden Apr. 1983 236 p refs Sponsored by Netherlands Organization for the Advancement of Pure Research (ZWO)
(WTHD-154) Avail: NTIS HC A11/MF A01

It is shown how structural properties results can be used in an interactive design procedure such as the inverse-nyquist array method. It is demonstrated that any strictly proper system can be decomposed into a feedback connection of two subsystems. Decomposition of the system such that the resulting system is described as the feedback connection of only prime subsystems, is used for determining a reduced order model containing all relevant information. It is shown that for squaring down, the problem of introducing and assigning zeros is equivalent to a pole assignment problem under output-feedback. Definitions for poles, zeros and decoupling zeros at infinity are proposed. It is shown that these definitions together with known definitions for finite poles, zeros and decoupling zeros yield identical results when applied to an arbitrary polynomial system matrix and to the corresponding system matrix in generalized state-space form. Algorithms which extract all structural properties of a strictly proper and of a nonproper multivariable system are presented. Author (ESA)

64 NUMERICAL ANALYSIS

Includes iteration, difference equations, and numerical approximation.

N83-28927 Oregon State Univ., Corvallis.
ZERO-REST-MASS FIELDS FROM THE FORMULA OF A TUBE IN COMPLEX PROJECTIVE 3-SPACE Ph.D. Thesis
Mohammed Ali Bashir 1983 110 p
Avail: Univ. Microfilms Order No. DA8226246

The formula of the volume of the tube in complex projective three dimensional space is studied. This formula is a polynomial in the radius of the tube with coefficients (Chern forms) which are topological invariants. We are motivated by these topological invariants to look for a physical significance of the formula of the volume of the tube using twistor theory, where a twistor space can be viewed as a complex projective three-space. It is shown that the formulae of tubes around the complex projective one dimensional space and around the complex projective two dimensional space in twistor space represent zero-rest-mass fields of spin 3/2 and spin 2 respectively. Thus they give rise to coupled neutrino (spin 1/2) fields and a weak gravitational Einstein's field respectively. This is demonstrated by using Penrose correspondence between the complex projective three-space and Minkowski space. Penrose transform is utilized to transfer cohomology data from the complex projective three-space to the Minkowski space. Dissert. Abstr.

N83-28928 Purdue Univ., Lafayette, Ind.
FINITE DIFFERENCE METHODS FOR NEARLY SINGULAR PROBLEMS Ph.D. Thesis
William Ashurst Ward, Jr. 1982 204 p
Avail: Univ. Microfilms Order No. DA8225784

An approach to the solution of partial differential equations based on the HODIE method of Lynch and Rice for elliptic boundary value problems is presented. The method is designed to be most effective on problems which are termed nearly singular. Several applications involving problems of this type are given, followed by a survey of existing methods for both singular and nearly singular problems. Because their lower dimensionality makes them easier to handle, and because they are often approached in a manner computationally similar to elliptic equations, two-point boundary value problems in ordinary differential equations are first considered. A theoretical justification of the technique notes that it reduces the constant, not increases the exponent, on the leading term of

the truncation error. The usefulness of the method depends on the efficient generation of a basis function which models the nearly singular behavior of the solution; several schemes for accomplishing this are discussed. The HODIE method using one or more special basis functions is then presented, along with a discussion of the overhead they require. The effectiveness of the technique is demonstrated and its sensitivity to disturbances in its parameters is investigated in a series of numerical experiments involving both one and two dimensional Dirichlet problems. Dissert. Abstr.

N83-28929 Virginia Univ., Charlottesville.
APPROXIMATING MARKOV DECISION PROCESSES WITH MULTI-MODULE MARKOV DECISION PROCESSES Ph.D. Thesis
Jeffrey Lee Popyack 1982 188 p
Avail: Univ. Microfilms Order No. DA8228604

The Markov decision process (MDP) is used as a model for optimization in problems involving sequential decision making under uncertainty. A procedure for determining a suboptimal decision rule for an important class of large-scale MDP is presented and evaluated. The MDP considered is the infinite horizon, total expected discounted cost MDP with finite state and action spaces. Dissert. Abstr.

N83-28930 Cornell Univ., Ithaca, N. Y.
ON THE CONVERGENCE OF THE BOUNDARY ELEMENT METHOD Ph.D. Thesis
Nilotpal Ghosh 1982 123 p
Avail: Univ. Microfilms Order No. DA8228435

The Boundary Element Method (BEM) is one of the important numerical methods used to obtain an approximate solution to a partial differential equation. This method is quite popular with engineers and for the last one or two decades it was used extensively for solving problems especially in potential theory and elastostatics. Proofs for the convergence of the Boundary Element Method for some important partial differential equations including Laplace's and Poisson's equations in 2 and 3 dimensions and the Helmholtz equation are presented. The estimates for the bounds of errors, i.e., the discrepancy of the approximate solutions from the exact ones are obtained in sub infinity norm. Dissert. Abstr.

N83-28931 Cornell Univ., Ithaca, N. Y.
FINITE ELEMENT FORMULATION OF THE GENERAL MAGNETOSTATIC PROBLEM IN THE SPACE OF SOLENOIDAL VECTOR FUNCTIONS Ph.D. Thesis
Mark Joel Friedman 1982 60 p refs
Avail: Univ. Microfilms Order No. DA8228391

A new finite element method for the solution of the general magnetostatic problem is formulated and analyzed. The space of trial functions consists of solenoidal piecewise polynomial vector functions. An integral formulation is used for the flux density, in the domain occupied by magnetic material. Using the properties of the spectrum of the relevant singular integral operator a weak formulation with an integral operator on the boundary only is derived. Thus the resulting finite element matrix is sparse. Using the method of monotone operators, existence and uniqueness of solution are proved. Error estimates are derived with the special emphasis on the case when magnetic permeability is large, numerical solution of the problem by successive iteration is analyzed. Dissert. Abstr.

N83-28932 Vanderbilt Univ., Nashville, Tenn.
GENERALIZED FUNCTIONS OF BOUNDED VARIATION AND THEIR APPLICATION TO THE THEORY OF HARMONIC FUNCTIONS Ph.D. Thesis
Daniel S. Cyphert 1982 117 p
Avail: Univ. Microfilms Order No. DA8228208

The functions of bounded variation, a generalization of bounded variation, where kappa is a strictly increasing concave function with infinite slope at the origin mapping the [0,1] onto itself, and is used to scale the lengths of intervals. If kappa is the identity function one gets classical bounded variation. Closely related to the functions of kappa bounded variation are the kappa decreasing functions, again a generalization of decreasing functions. The basic properties and relationships for functions of kappa bounded variation and for kappa decreasing functions paralleling in many cases the results for functions of bounded variation and decreasing functions are established, and some examples and counterexamples to clarify the relationship between bounded variation and kappa bounded variation are provided. In particular a Helly type selection theorem for infinite families of uniformly bounded uniformly kappa decreasing functions and a decomposition theorem showing that every function of kappa bounded variation is the difference of two kappa decreasing functions is proved. Dissert. Abstr.

N83-28933# Aircraft Research Association Ltd., Bedford (England).
ANALYSIS OF GRID INDUCED ERRORS IN THE SOLUTION OF THE FULL POTENTIAL EQUATION
M. G. Edwards Jun. 1983 64 p refs
(ARA-242) Avail: NTIS HC A04/MF A01

Some field methods used to solve the full potential equation for subsonic and transonic flows are analysed to determine the errors induced in the solution by the use of irregular grid spacings. For a model problem in one dimension it is shown that coordinate transform techniques can result in errors which may be eliminated by physically based differencing. The finite volume method, the two-dimensional equivalent of physically based differencing, is described and some improvements suggested. Finally, the extra errors induced by the retarded density approach in solutions having supercritical regions are investigated. Author

N83-28934*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va. Inst. for Computer Applications in Science and Engineering.
PARAMETER IDENTIFICATION IN CONTINUUM MODELS Final Report
H. T. Banks and J. M. Crowley May 1983 8 p refs
(Contracts NAS1-15810; NAS1-16394; DAAG29-79-C-0161; Grants NSF MCS-82-05335; AF-AFOSR-0198-81)
(NASA-CR-172132; NAS 1.26:172132; Rept-83-13) Avail: NTIS HC A02/MF A01 CSCL 12A

Approximation techniques for use in numerical schemes for estimating spatially varying coefficients in continuum models such as those for Euler-Bernoulli beams are discussed. The techniques are based on quintic spline state approximations and cubic spline parameter approximations. Both theoretical and numerical results are presented. M.G.

N83-28935*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
M-STEP PRECONDITIONED CONJUGATE GRADIENT METHODS
Loyce Adams Apr. 1983 32 p refs
(Contracts NAS1-15810; NAS1-17070; NAS1-1730; Grant NAG1-46)
(NASA-CR-172713; ICASE-83-9; NAS 1.26:172713) Avail: NTIS HC A03/MF A01 CSCL 12A

Preconditioned conjugate gradient methods for solving sparse symmetric and positive finite systems of linear equations are described. Necessary and sufficient conditions are given for when these preconditioners can be used and an analysis of their effectiveness is given. Efficient computer implementations of these methods are discussed and results on the CYBER 203 and the Finite Element Machine under construction at NASA Langley Research Center are included. M.G.

N83-28936*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
THE LARGE-TIME BEHAVIOR OF THE SCALAR, GENUINELY NONLINEAR LAX-FRIEDRICHS SCHEME Final Report
Eitan Tadmor 13 Jun. 1983 33 p refs
(Contract NAS1-17070)
(NASA-CR-172138; ICASE-83-15; NAS 1.26:172138) Avail: NTIS HC A03/MF A01 CSCL 12A

The Lax-Friedrichs scheme, approximating the scalar, genuinely nonlinear conservation law u sub t + f sub x (u) = 0 where f(u) is, say, strictly convex double dot f > dot a sub asterisk > 0 is studied. The divided differences of the numerical solution at time t do not exceed 2 (t dot a sub asterisk) to the -1. This one-sided Lipschitz boundedness is in complete agreement with the corresponding estimate one has in the differential case; in particular, it is independent of the initial amplitude in sharp contrast to liner problems. It guarantees the entropy compactness of the scheme in this case, as well as providing a quantitive insight into the large-time behavior of the numerical computation. Author

N83-28937*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
SPECTRAL MULTIGRID METHODS FOR ELLIPTIC EQUATIONS 2 Final Report
Thomas A. Zang (Coll. of William and Mary, Williamsburg, Va.), Yau Shu Wong, and M. Yousuff Hussaini May 1983 34 p refs
(Contracts NAS1-17070; NAS1-17130; Grant NAG1-109)
(NASA-CR-172131; ICASE-83-12; NAS 1.26:172131) Avail: NTIS HC A03/MF A01 CSCL 12A

A detailed description of spectral multigrid methods is provided. This includes the interpolation and coarse-grid operators for both periodic and Dirichlet problems. The spectral methods for periodic problems use Fourier series and those for Dirichlet problems are based upon Chebyshev polynomials. An improved preconditioning for Dirichlet problems is given. Numerical exampies and practical advice are included. Author

N83-28938*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
NUMERICAL VISCOSITY AND THE ENTROPY CONDITION FOR CONSERVATIVE DIFFERENCE SCHEMES Final Report
Eitan Tadmor Jun. 1983 29 p refs
(Contract NAS1-17070)
(NASA-CR-172141; ICASE-83-20; NAS 1.26:172141) Avail: NTIS HC A03/MF A01 CSCL 12A

Consider a scalar, nonlinear conservative difference scheme satisfying the entropy condition. It is shown that difference schemes containing more numerical viscosity will necessarily converge to the unique, physically relevant weak solution of the approximated conservation equation. In particular, entropy satisfying convergence follows for E schemes - those containing more numerical viscosity than Godunov's scheme. Author

N83-28939*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
N-PERSON DIFFERENTIAL GAMES. PART 1: DUALITY-FINITE ELEMENT METHODS Final Report
Goong Chen and Quan Zheng Apr. 1983 70 p refs
(Contract NAS1-15810; Grant NSF MCS-81-01892)
(NASA-CR-166110; NAS 1.26:166110; Rept-83-7) Avail: NTIS HC A04/MF A01 CSCL 12A

The duality approach, which is motivated by computational needs and is done by introducing N + 1 Language multipliers is addressed. For N-person linear quadratic games, the primal min-max problem is shown to be equivalent to the dual min-max problem. Author

N83-28940*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
AN M-STEP PRECONDITIONED CONJUGATE GRADIENT METHOD FOR PARALLEL COMPUTATION Final Report
Loyce Adams Jun. 1983 10 p refs
(Contracts NAS1-15810; NAS1-17070; NAS1-17130; Grant NAG1-46)
(NASA-CR-172150; ICASE-83-23; NAS 1.26:172150) Avail: NTIS HC A02/MF A01 CSCL 12A

This paper describes a preconditioned conjugate gradient method that can be effectively implemented on both vector machines and parallel arrays to solve sparse symmetric and positive definite systems of linear equations. The implementation on the CYBER 203/205 and on the Finite Element Machine is discussed and results obtained using the method on these machines are given. Author

N83-28941# Naval Ocean Systems Center, San Diego, Calif. Communications Systems and Technology Dept.
PERFORMANCE OF A VARIABLE-CONSTRAINT-LENGTH VITERBI DECODING ALGORITHM
J. K. Tamaki Aug. 1982 20 p refs
(AD-A125021; NOSC/TR-831) Avail: NTIS HC A02/MF A01 CSCL 12/1

Document demonstrates that the computational complexity of the Viterbi decoding algorithm can be reduced for Maximum Likelihood Sequence Estimation on time variant, fading channels when the channel constraint length is reduced. An algorithm is developed that reduces the computational complexity of the Viterbi decoding algorithm. For time-variant, fading channels, the effective constraint length may expand or contract, and it is shown that we can expand or contract the state trellis diagram of the Viterbi algorithm accordingly. The derived algorithm requires knowledge of the channel's intersymbol interference patterns. These results apply not only to the hf channel, but to any channel characterized by convolutional encoding. In addition, channels that demonstrate catastrophic behavior are found and discussed. GRA

N83-28942# Michigan Univ., Ann Arbor. Systems Engineering Lab.
RANDOMLY SPARSE EQUATION SOLUTION BY LOOPLESS CODE GENERATION ON THE CRAY-1 Interim Report
D. A. Calahan 1 Aug. 1982 33 p refs
(Grant AF-AFOSR-0158-80; AF Proj. 2304)
(AD-A125738; SEL-162; AFOSR-83-0077TR) Avail: NTIS HC A03/MF A01 CSCL 12/1

To solve directly a sparse, unsymmetric matrix equation Ax = b, an equation-ordering algorithm based on local equation decoupling is proposed to maintain a high flow rate of scalar computations within a floating point pipeline. Software is described to solve highly-sparse unpatterned systems efficiently via explicit code generation. Rates in the range of 15 MFLOPS on the CRAY-1 are achieved. Author (GRA)

N83-28943*# Brown Univ., Providence, R. I. Center for Dynamical Systems.
ESTIMATION OF VARIABLE COEFFICIENTS IN PARABOLIC DISTRIBUTED SYSTEMS
H. T. Banks and P. L. Daniel (Southern Methodist Univ., Dallas) Sep. 1982 57 p refs
(Contracts NAS1-15810; NAS1-16394; DAAG29-79-C-0161; Grants AF-AFOSR-0198-81; NSF MCS-82-05355; NSF MCS-82-00883; AF Proj. 2304)
(NASA-CR-170366; NAS 1.26:170366; AD-A125739; LCDS-82-22; AFOSR-83-0112TR) Avail: NTIS HC A04/MF A01 CSCL 12/1

We present techniques based on cubic spline approximations for estimating coefficients (e.g., diffusion, convective velocity, etc.) depending on time and the spatial variable in parabolic distributed systems such as those that arise in transport models. Covergence results and a summary of numerical performance of the resulting algorithms are given. Author (GRA)

N83-28944# Michigan Univ., Ann Arbor. Systems Engineering Lab.
A VECTORIZED GENERAL SPARSITY SOLVER Interim Report
D. A. Calahan 1 Oct. 1982 31 p refs
(Grant AF-AFOSR-0158-80; AF Proj. 2304)
(AD-A125766; SEL-168; AFOSR-83-0076TR) Avail: NTIS HC A03/MF A01 CSCL 12/1

Description and use of a FORTRAN general sparse solver, modified to run efficiently on a vector processor, is given. CRAY-1 performance in the analysis of 2D grids is presented. Author (GRA)

N83-28945# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.

ANALYSIS OF SIX ALGORITHMS FOR BEARINGS-ONLY RANGING IN AN AIR-TO-AIR ENVIRONMENT M.S. Thesis
Donald E. Stiffler Dec. 1982 273 p refs
(AD-A125405; AFIT/GE/EE/82D-64) Avail: NTIS HC A12/MF A01 CSCL 12A

Six algorithms for finding the range to an airborne target using noise-corrupted bearing and bearing rate measurements from an airborne sensor were developed and evaluated. The algorithms all employ extended Kalman filters, one using a spherical coordinate system representation, and the other five using Cartesian system representation. The target models include independent, Gauss-Markov acceleration (two algorithms), constant turn rate motion in a single plane (one algorithm), and basically straight and level flight (three algorithms). The algorithms were evaluated in a Monte Carlo analysis. The truth model for this analysis was based upon two trajectories, one for the target and one for the attacker, which were deterministically set before the Monte Carlo runs. The output of the simulation was composed of plots of the error process, including the mean of the errors, the mean of the errors plus and minus one standard deviation, and the positive and negative filter-generated estimate of the standard deviation of the errors. It was found that, due to an observability problem, only the algorithms which modelled target motion as straight and level flight worked satisfactorily. These algorithms worked best in scenarios in which the actual target motion was nearly directly toward or directly away from the attacking aircraft. GRA

N83-28946# Maryland Univ., College Park. Computer Vision Lab.
SOME NOTES ON DIGITAL TRIANGLES
Azriel Rosenfeld Sep. 1982 14 p refs
(Grant AF-AFOSR-3171-77; AF Proj. 2304)
(AD-A125574; TR-1217; AFOSR-83-0067TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

This document discusses some simple properties of digital triangles, whose vertices are lattice points and whose side lengths are measured using city block distance. Many of the familiar theorems of geometry break down in this situation. Author (GRA)

N83-28947# Maryland Univ., College Park. Computer Vision Lab.
A NOTE ON GEOMETRIC TRANSFORMS OF DIGITAL SETS
Azriel Rosenfeld Sep. 1982 10 p refs
(Grant AF-AFOSR-3271-77; AF Proj. 2304)
(AD-A125580; TR-1218; AFOSR-83-0066TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

Document defines a geometric transform on the digital plane as a function f that takes pairs (P,S), where S is a set and P a point of S, into nonnegative integers, and where f (S,P) depends only on the positions of the points of S relative to P. Transforms of this type are useful for segmenting and describing S. Two examples are distance transforms, for which f (S,P) is the distance from P to S, and isovist transforms, where f (S,P) is (e.g.) the area of the part of S visible from P. This note characterizes geometric transforms that have certain simple set-theoretic properties. It is shown that a geometric transform has this intersection property if and only if it is defined in a special way in terms of a neighborhood base; the class of such neighborhood transforms is a generalization of the class of distance transforms. GRA

N83-28948# Utah Univ., Salt Lake City. Dept. of Mathematics.
MULTIPARAMETER ACOUSTIC IMAGING IN THE BORN APPROXIMATION Technical Summary Report
Calvin H. Wilcox Aug. 1982 40 p refs
(Contract N00014-76-C-0276; Grants PHS-PDT-110B; PHS-1R01-CA-29728)
(AD-A125584) Avail: NTIS HC A03/MF A01 CSCL 12/1

Computer-based acoustic imaging techniques have been studied intensively during the last decade. Typical techniques involve irradiating a sample with prescribed sound fields, measuring the resulting scattered fields and applying a computational algorithm to the scattering data to produce maps of such sample parameters as density, sound speeds and perhaps others. These techniques have important applications to medical ultrasonic imaging where the sample is a living organism, to non-destructive evaluation where the sample is a manufactured item such as a metal casting or ceramic object and to geophysical prospecting where the sample is a portion of the Earth's crust. This paper treats a problem of medical ultrasonic imaging. The sample is modelled as an inhomogeneous fluid which is characterized by a variable density rho(x) and sound speed c(x). The use of a fluid model is motivated by the fact that in biological tissues, other than bone, acoustic shear waves are not observed. In acoustic imaging, the scale of the smallest structures that can be resolved is of the order of the smallest wavelength employed. A typical sound speed in biological tissue is c = 1500 m/sec. GRA

N83-28949# Maryland Univ., College Park. Computer Vision Lab.
ON DIGITAL CIRCLES
Akira Nakamura and Kunio Aizawa Jul. 1982 21 p refs
(Grant AF-AFOSR-3271-77)
(AD-A125586; TR-1193; AFOSR-83-0072TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

This paper characterizes sets of lattice points which are digitizations of circles. Author (GRA)

N83-28950# Maryland Univ., College Park. Computer Vision Lab.
DIAMETER-TIME CELLULAR WARPING
Azriel Rosenfeld Nov. 1982 11 p refs
(Grant AF-AFOSR-3271-77; AF Proj. 2304)
(AD-A125589; TR-1230; AFOSR-83-0068TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

This note describes a cellular array algorithm for performing a general class of geometrical operations on a nxn digital image in 0(n) time. Author (GRA)

N83-28951# Washington Univ., St. Louis, Mo. Dept. of Systems Science and Mathematics.
THE CONSTRAINT METHOD FOR SOLID FINITE ELEMENTS Final Scientific Report, 1 Oct. 1976 - 30 Sep. 1982
I. Norman Katz 30 Nov. 1982 35 p refs
(Grant AF-AFOSR-0252-81; AF Proj. 2305)
(AD-A125595; AFOSR-83-0080TR) Avail: NTIS HC A03/MF A01 CSCL 12/1

The p-version of the finite element method is a new approach to finite element analysis which has been demonstrated to lead to significant computational savings, often by orders of magnitude (this approach was formerly called the constraint method; the new term p-version is more descriptive). Conventional approaches (called the h-version) generally employ low order polynomials as basis functions. Accuracy is achieved by suitably refining the approximating mesh. The p-version uses polynomials of arbitrary order p is > or = 2 for problems in plane elasticity where CO continuity is required and polynomials of order p is > or = 5 for problems in plate bending where C1 continuity is required. GRA

N83-28952# Connecticut Univ., Storrs. Dept. of Electrical Engineering and Computer Science.
PERFORMANCE BOUNDS IN ROBUST FILTERING AND SMOOTHING
P. Papantoni-Kazakos 20 Oct. 1982 43 p refs
(Grant AF-AFOSR-3695-78; AF Proj. 2304)
(AD-A125723; TR-82-6; AFOSR-83-0110TR) Avail: NTIS HC A03/MF A01 CSCL 12/1

Filtering and smoothing within a convex and closed family of stationary processes is considered. The performance criterion adopted is the mean square error. Using a saddle point game approach, we develop two classes of lower bounds for this error. Those bounds can be used as evaluation measure in the design of robust filters and smoothers. Author (GRA)

N83-28953# Colorado Univ., Boulder. Dept. of Computer Science.

SOFTWARE AID FOR OPTIMIZING 0-1 MATRICES
R. Michael Perry Nov. 1982 15 p refs
(Contract N00014-78-C-0433)
(AD-A125724; CU-CS-242-82) Avail: NTIS HC A02/MF A01 CSCL 12/1

The problem has arisen in a study of the retention of information from visual and verbal sources. Mathematically it is likely to be a difficult problem, however, and thus only good not optimal solutions are expected. A software package has been written to assist a human operator in searching for such desirable matrices. This is described here, and its use in the study is reviewed. GRA

N83-28954# Massachusetts Inst. of Tech., Cambridge. Lab. for Information and Decision Systems.
HIERARCHICAL AGGREGATION OF LINEAR SYSTEMS WITH MULTIPLE TIME SCALES
M. Coderch, A. S. Willsky, S. S. Sastry, and D. A. Castanon Oct. 1982 7 p refs
(Grant AF-AFOSR-0258-82; AF Proj. 2304)
(AD-A125669; AFOSR-83-0085TR; LIDS-P-1224) Avail: NTIS HC A02/MF A01 CSCL 12/1

Models of large scale systems typically include weak couplings between subsystems. This results in the evolution of different portions of the system at different time scales. Frequency, intuition suggests that subsystems or groups of states evolve slowly in comparison with their internal dynamics. This suggests that the overall system dynamics analysis may be simplified (or sometimes made tractable) by separately analyzing the dynamics at a specific time scale - by assuming constancy of variables evolving at slower time scales and steady state values for variables at faster time scales. If this intuition were to hold true, it then follows that system behavior may be approximated by means of a hierarchy of increasingly simplified models valid at progressively slower time scales. The motivation for the present work came from mathematical models for interconnected power systems. These models have variations on several time scales - nearly instantaneous adjustment of loadbus angles and voltages, dynamics of the swing equations, voltage regulator and turbine power generation dynamics, generation scheduling (set point changes) are examples of progressively slower dynamics. With this general philosophy in mind, the authors study a very simple class of systems - linear and time invariant. For this class of systems they model weak coupling by parametric dependence of the linear system on epsilon, and obtain tight conditions under which a hierarchy of reduced order models valid at different time scales may be constructed. The study of this (deterministic) equation is also relevant to the hierarchical aggregation of finite state Markov processes with some rare transitions. GRA

N83-28955# North Carolina Univ., Chapel Hill. Center for Stochastic Processes.
EXTREME VALUES OF NON-STATIONARY SEQUENCES AND THE EXTREMAL INDEX
Jurg Husler (Bern Univ.) Oct. 1982 17 p refs
(Contract F49620-82-C-0009; AF Proj. 2304)
(AD-A125606; AFOSR-83-0074TR; TR-20) Avail: NTIS HC A02/MF A01 CSCL 12/1

The conditions used to generalize the extreme value theory for stationary random sequences to non-stationary sequences are studied with respect to their necessity. The authors find that the extremal index, defined in the stationary case, plays a similar role in the non-stationary case. The details show that this index describes not only the behavior of exceedances above a high level constant boundary, but also above a non-constant high level boundary. GRA

N83-28956# Maryland Univ., College Park. Lab. for Computer Vision.
RECOGNITION OF SURFACE IN THREE-DIMENSIONAL DIGITAL IMAGES
George M. Reed (Ohio Univ.) and Azriel Rosenfeld Aug. 1982 29 p refs
(Grant AF-AFOSR-3271-77; AF Proj. 2304)
(AD-A125608; AFOSR-83-0070TR; TR-1210) Avail: NTIS HC A03/MF A01 CSCL 12/1

This is a continuation of a series of papers on the digital geometry of three-dimensional images. In an earlier paper by Morgenthaler and Rosenfeld, a three-dimensional analog of the two-dimensional Jordan Curve Theorem was established. This was accomplished by defining simple surface points under the symmetric consideration of 6-connectedness and 26-connectedness and by characterizing a simple closed surface as a connected collection of orientable simple surface points. The necessity of the assumption of orientability, a condition of often prohibitive computational cost to establish, was the major unresolved issue of that paper. In this paper, we show the assumption not to be necessary in the case of 6-connectedness and, unexpectedly, show that the property of orientability is not symmetric with respect to the two types of connectedness. Author (GRA)

N83-28957# Ballistic Research Labs., Aberdeen Proving Ground, Md.
AN ALGORITHM FOR COMPUTING DERIVATIVES OF NOISY DATA
Ceslovas Masaitis and George Francis Mar. 1983 28 p refs
(DA Proj. 1L1-62618-AH-80)
(AD-A126127; AD-F300216; ARBRL-MR-03251) Avail: NTIS HC A03/MF A01 CSCL 12/1

An algorithm for computing derivatives of noisy data, as described by the authors in two previous reports, is modified, and empirical support for the choice of relative weights for approximating functions is provided. The algorithm is applied to ten sets of synthetic data generated by evaluating analytic functions and addition pseudo-random errors to their values. The accuracy of the estimates of the first and second derivatives is on the average almost five times better than that obtained by cubic B-spline approximation. Extrapolation is considered. GRA

N83-28958# Sandia Labs., Albuquerque, N. Mex.
TAYLOR-SERIES APPROXIMATION FOR THE CONVECTIVE HEAT FLUX IN THERMAL-HYDRAULIC COMPUTER CODES
S. E. Dingman and R. A. Nelson 1982 12 p Presented at the Intern. Meeting on Thermal Nucl. Reactor Safety, Chicago, 29 Aug. 1982
(Contract DE-AC04-76DP-00789)
(DE82-005686; SAND-82-0201C; CONF-820802-2) Avail: NTIS HC A02/MF A01

A technique for decreasing the computer execution time for convective heat transfer calculations in transient thermal-hydraulic computer codes is investigated. The technique consists of approximating the convective heat flux by the first order terms of a Taylor series expansion with fluid and heat structure conditions as independent variables. The approximation is used until the system state point varies enough to make the approximation inaccurate. The technique was incorporated into RELAP5 and calculations were performed to determine the savings in computer execution time and to verify the accuracy of the approximation. In slowly varying transients, the approximation ran up to 19% faster than the current RELAP5 technique. In rapidly varying transients it ran slower. Investigations show the technique can provide the savings desired and that with future development of criteria of when to use and when not to use the approximation, it represents a significant calculational improvement to the code. Dissert. Abstr.

N83-28959# Oak Ridge National Lab., Tenn. Computer Sciences.
AN INVESTIGATION OF THE EFFECTS OF CORRELATED MEASUREMENT ERRORS IN TIME SERIES ANALYSIS TECHNIQUES APPLIED TO NUCLEAR MATERIAL ACCOUNTANCY DATA
D. H. Pike, G. W. Morrison, and D. J. Downing Apr. 1982 132 p refs
(Contract W-7405-eng-26)
(DE82-009602; ORNL/CSD/TM-169) Avail: NTIS HC A07/MF A01

It has been shown in previous work that the Kalman filter and

linear smoother produces optimal estimates of inventory and loss from a material balance area. The assumptions of the Kalman filter linear smoother approach assume no correlation between inventory measurement error nor does it allow for serial correlation in these measurement errors. The previous results are extended by relaxing these assumptions to allow for correlation of measurement errors. The results show how to account for correlated measurement errors in the linear system model of the Kalman filter linear smoother. An algorithm is also included for calculating the required error covariance matrices. DOE

N83-28960# Oak Ridge Gaseous Diffusion Plant, Tenn. Operations Analysis and Planning Dept.
GREEN'S FUNCTION FOR ONSAGER'S PANCAKE EQUATION
M. H. Berger Feb. 1983 17 p refs
(Contract W-7405-eng-26)
(DE83-009281; K/OA-5424) Avail: NTIS HC A02/MF A01

A Green's function was derived for Onsager's one-dimensional pancake equation for the approximate internal flow in a gas centrifuge. The new, exact solution was verified by comparison with a previous solution for the flow induced by a point source of axial momentum. The qualitative character of the solution is illustrated in an example where the position of the source point is varied. DOE

N83-28961# Princeton Univ., N. J. Plasma Physics Lab.
DRIFT HAMILTONIAN IN MAGNETIC COORDINATE
R. B. White, A. H. Boozer, and R. Hay Feb. 1982 12 p refs
(Contract DE-AC02-76CH-03073)
(DE82-011938; PPL-1880) Avail: NTIS HC A02/MF A01

A Hamiltonian formulation of the guiding-center drift in arbitrary, steady state, magnetic and electric fields is given. The canonical variables of this formulation are simply related to the magnetic coordinates. The modifications required to treat ergodic magnetic fields using magnetic coordinates are explicitly given in the Hamiltonian formulation. DOE

N83-28962# Sandia Labs., Albuquerque, N. Mex. Numerical Mathematics Div.
TYPE-INSENSITIVE ODE CODES BASED ON EXTRAPOLATION METHODS
Lawrence F. Shampine Jun. 1982 24 p refs
(Contract DE-AC04-76DP-00789)
(DE82-018549; SAND-82-1195) Avail: NTIS HC A02/MF A01

A differential equation solving code, METAN1, is discussed. It is particularly designed for solving stiff problems by extrapolation of a semi-implicit midpoint rule. DOE

N83-28963# Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Applied Mathematics.
ON A FORMULA FOR THE DIRECTION OF HOPF BIFURCATION
S. A. vanGils Sep. 1982 23 p refs Submitted for publication
(MC-TW-225/82) Avail: NTIS HC A02/MF A01

A formula determining generically the direction of Hopf bifurcation for a large class of evolution equations including ordinary differential equations (ODE) retarded functional differential equations, Volterra integral equations and parabolic differential equations is derived. The result is an algorithm which in the case of ODE and retarded functional differential equations resolves into the inversion of two matrices. Author (ESA)

N83-28964# Sheffield Univ. (England). Dept. of Control Engineering.
ROBUST CONTROLLER DESIGN FOR LINEAR DYNAMIC SYSTEMS USING APPROXIMATE MODELS
D. H. Owens and A. Chotai Jul. 1982 47 p refs
(Grant SRC-GR/B/23250)
(RR-194) Avail: NTIS HC A03/MF A01

Frequency-domain design techniques are extended to incorporate information deduced from the observed differences between open-loop plant and approximate model step response to quantify the uncertainty and, in particular, to guarantee closed-loop stability and tracking of step demands. A modification of this analysis uses time-domain data, leading to a simple simulation method for assessing stability that avoids the need for complex frequency domain calculations. It also yields the possibility of bounding the error in prediction of closed-loop transient performance. The approaches are all graphical in nature and are easily implemented in an interactive computer aided design mode. Author (ESA)

N83-28965# Universite des Sciences et de la Technologie Houari Boumediene, Algiers (Algeria). Inst. de Mathematiques.
REGULARITY RESULTS IN THE PROPAGATION OF SINGULARITIES FOR SOME EVOLUTION EQUATIONS IN A PLANE POLYGONAL DOMAIN
M. A. Moussaoui and B. K. Sadallah 1982 21 p refs
(PB83-144873) Avail: NTIS HC A02/MF A01 CSCL 12A

It is well known that the solutions of elliptic problems in a polygonal domain can present a singular part. The regularity of the propagation of these singularities is studied in some evolution equations as the heat equation with Cauchy-Dirichief or Cauchy-Neumann boundary conditions and the wave equation with Cauchy-Dirichief boundary conditions. Author

65 STATISTICS AND PROBABILITY

Includes data sampling and smoothing; Monte Carlo method; and stochastic processes.

N83-28966# School of Aerospace Medicine, Brooks AFB, Tex.
AN ALGORITHM FOR THE UNIVARIATE ANALYSIS OF VARIANCE IN EXPERIMENTS WITH REPEATED MEASURES Final Report, Aug. 1980 - Aug. 1982
William G. Jackson, Jr. and Richard C. McNee Dec. 1982 18 p refs
(AF Proj. 7930)
(AD-A125380; SAM-TR-82-37) Avail: NTIS HC A02/MF A01 CSCL 12/1

A computing procedure is described for the univariate analysis of a repeated measurements experiment where the experimental units (frequently subjects) are arranged in a two-way classification with cell frequencies that can be disproportionate. The analysis is adjusted for missing values, provided their number and configuration do not violate certain limitations. Unlike some strategies for handling missing values in repeated measurements experiments, the method does not require the inclusion in the model of an explicit subject factor, meaning that the order of the matrix to be inverted does not depend on the number of subjects in the experiment. The algorithm has been incorporated into a SAS procedure, REP2W1F, which computes the full analysis with a single call and produces useful summary statistics (including least-squares means) particular to the design. The approach could be generalized to experiments where the number of treatment factors is other than two and where the repeated measures that a factorial arrangement of their own. GRA

N83-28967# Ohio State Univ., Columbus. Dept. of Statistics.
JACKKNIFING KERNAL TYPE DENSITY ESTIMATORS Technical Report, 1 Apr. 1980 - 28 Feb. 1983
J. S. Rustagi and S. Dynin Feb. 1983 16 p refs
(Contract N00014-82-K-0291; NR Proj. 042-403)
(AD-A125701; OSU-TR-280) Avail: NTIS HC A02/MF A01 CSCL 12/1

Jackknifing techniques are increasingly being applied to data analysis for bias reduction. In robust estimation, several studies have recently been published giving asymptotic properties of jackknifed estimates. Cheng has demonstrated the validity of jackknifing L-estimates under various conditions on the score function. Efron has shown that jackknife turns out to be special case of his bootstrap technique. In problems of density estimation, improvement of kernel type estimates was proposed by Schucany and Sommer through the technique of combining several esti-

mates using different kernels. Usually it is possible to reduce bias in kernel-type estimates simply by a judicious choice of a kernel. However, in that case, the estimates of density functions can be negative. The situation has been described by Stute in his paper showing that the use of nonnegative kernels does not allow the possibility of reduction of bias. In this paper, the effect of jackknifing using leave-out rules, is studied. Pseudovalues in case of density estimates are defined and optimal properties of the jackknifed estimates are given. It is shown that the asymptotic behavior of the jackknifed estimates is the same as that of the classical estimate. A Berry-Esseen type central limit theorem showing the normality of the jackknifed estimate is also given. Author (GRA)

N83-28968# Oak Ridge National Lab., Tenn. Environmental Sciences Div.
EFFECT OF STOCHASTIC VARIATION ON ESTIMATES OF THE PROBABILITY OF ENTRAINMENT MORTALITY: METHODOLOGY, RESULTS, AND USER'S GUIDE
S. W. Christensen and D. L. DeAngelis Jun. 1982 81 p refs
(Contract W-7405-eng-26)
(DE82-016859; NUREG/CR-2533; ORNL/TM-7965; P-1832) Avail: NTIS HC A05/MF A01

The probability that live fish eggs or larvae, entrained in cooling water, will be killed is an important element in projecting power plant effects on fish stocks. This probability, the entrainment mortality factor, is commonly estimated with one of several relatively simple formulae which use data collected from intake and discharge water. Such biological phenomena as gear avoidance, gear-induced mortality, extrusion through nets, and the presence of dead organisms in ambient water introduce errors into estimates obtained with these formulae. An additional difficulty is that, because of small sample sizes, it is usually necessary to combine data from many samples, taken under different conditions, before applying the formula. A Monte Carlo simulation model (ENTRAN) was developed to assess the accuracy and precision of entrainment mortality estimates derived via these formulae from field data. After repeated simulation over a range of selected entrainment mortalities for varying biological conditions, the reliability of mortality estimates was evaluated by comparing the estimates with the actual mortality that was selected for the model run. DOE

66 SYSTEMS ANALYSIS

Includes mathematical modeling; network analysis; and operations research.

N83-28969 Cincinnati Univ., Ohio.
STOCHASTIC ANALYSIS OF SYSTEMS HAVING MISSIONS OF RANDOM DURATION Ph.D. Thesis
Charles Elden Wells 1982 265 p
Avail: Univ. Microfilms Order No. DA8228813

The primary purpose of this research is to explore the use of system design techniques, such as component redundancy, maintainability, and preventive maintenance, to improve system performance for systems whose missions are of random duration. The main focus is on systems having components in the operating mode with a support facility which contains components or modules that are replications of the operating unit. Determining better system designs implies the use of a choice criterion. Therefore measures which are appropriate for optimization applications concerning systems having stochastic lifetimes are discussed. Methods of computing these measures for systems which exhibit regenerative, semi-Markovian, or Markovian behavior are considered. Next, a number of fairly specific system configurations are analyzed. In the first case, a system of identical unreliable but repairable components, n-1 of which are in standby, is treated. The second system is assumed to have the capability of preventive maintenance. Dissert. Abstr.

N83-28970# British Library Lending Div., Boston Spa (England).
FILTERING SIGNALS WHEN PARTIAL MODELS OF THEM ARE AVAILABLE
V. P. L. Avdeev, A. A. Ershov, L. P. Myshlyaev, E. A. Shchelokov, and Ya. G. Parparov 14 Apr. 1983 10 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Chernaya Met. (USSR), v. 4, 1982 p 121-126
(BLL-M-26974-(5828.4)) Avail: British Library Lending Div., Boston Spa, Engl.

The use of partial models of signals in filtering is considered. It is concluded that the inclusion of extermal and range characteristics of the variability of components in partial models leads to constructive results when process trends are to be determined. Further development of the corresponding approach and its generalization to problems of identification, control and planning and also to personnel training and encouragement are recommended. Author

N83-28971# Sheffield Univ. (England). Dept. of Control Engineering.
LINEAR DISCRETE SMOOTHING OF MULTIPASS PROCESSES
J. B. Edwards and A. M. S. R. Yazdi May 1982 25 p refs
(RR-191) Avail: NTIS HC A02/MF A01

The effect of an interpass process on the multipass behavior of an idealized coal-cutter steering process is analytically examined. A simple delay equation is used and the resulting analytical predictions are confirmed by simulation and used to guide the choice of parameters in the full process simulation. It is found that by enlarging conveyor tray lengths it is possible to stabilize the true process. More elaborate models were also examined, concluding that multipass stability can be produced by spatially discrete smoothing. Author (ESA)

N83-28972# Sheffield Univ. (England). Dept. of Control Engineering.
ANALYSIS AND DESIGN OF VARIABLE STRUCTURE SYSTEMS USING A GEOMETRIC APPROACH
O. M. E. El-Ghezawi, A. S. I. Zinober, and S. A. Billings Oct. 1982 21 p refs
(Grant SRC-GR/C/03119)
(RR-193) Avail: NTIS HC A02/MF A01

Multivariable variable structure nonlinear systems in the sliding mode are studied using a geometric approach. The properties of system order reduction and disturbance rejection are proved using projector theory. It is shown that Drazenovic's invariance conditions are a special case. The physical interpretation of invariance is given. The invariance of the system zeros in the sliding mode is investigated. Design methods for the choice of switching hyperplanes are derived for the closed-loop eigenvalue/eigenvector assignment problem. Author (ESA)

67 THEORETICAL MATHEMATICS

Includes topology and number theory.

N83-28973# Naval Research Lab., Washington, D. C.
INVARIANT CLUSTERING USING SCATTERING MATRICES Final Report
G. V. Trunk 23 Feb. 1983 13 p
(RR0210543)
(AD-A125398; NRL-8678) Avail: NTIS HC A02/MF A01 CSCL 12/1

One of the most difficult problems in clustering analysis is the choice of an appropriate distance metric. This problem arises because in many instances an object is described by n measurements involving different units (for example, a radar signal may be described by its frequency in gigahertz, its interpulse period in milliseconds, and its pulsewidth in microseconds). In this report I circumvent the problems by considering clustering algorithms which are invariant to scaling of the axes and hence to the choice of units. I compare quality of the clustering produced by the various algorithms by examining several test cases. No single algorithm yield the correct solution in all of the cases, but a possible hybrid

approach is to cluster the points using the product of the determinants of the scattering matrices and switch to the sum of the determinants if the product algorithm yields only degenerate solutions. Author (GRA)

70 PHYSICS (GENERAL)

For geophysics see *46 Geophysics*. For astrophysics see *90 Astrophysics*. For solar physics see *92 Solar physics*.

N83-28974 Max-Planck-Institut fuer Physik und Astrophysik, Garching (West Germany). Inst. fuer Physik.
[ACTIVITIES REPORT OF THE INSTITUTE OF PHYSICS] Annual Report, 1981
Dec. 1981 153 p refs In GERMAN Original contains color illustrations
(ISSN-0173-6256) Copyright. Avail: Issuing Activity

Elementary particle interactions were studied in a bubble chamber. Research into deep inelastic hadron-hadron interactions, field theory in low and high energy interactions, quark spectroscopy and quantum mechanics is summarized. Author (ESA)

N83-28975 Max-Planck-Institut fuer Physik und Astrophysik, Garching (West Germany). Inst. fuer Physik.
[ACTIVITIES REPORT OF THE INSTITUTE OF PHYSICS] Annual Report, 1982
Dec. 1982 164 p refs In GERMAN Original contains color illustrations
(ISSN-0173-6256) Copyright. Avail: Issuing Activity

Elementary particle interactions were studied in a bubble chamber. Research into deep inelastic hadron-hadron interactions, field theory in low and high energy interactions, quark spectroscopy and quantum mechanics is summarized. Author (ESA)

N83-28976# Brookhaven National Lab., Upton, N. Y.
FIELD ERRORS IN SUPERCONDUCTING MAGNETS
Mark Q. Barton 1982 9 p refs Presented at the Workshop on Accelerator Orbit and Particle Tracking Program, Upton, N.Y., 3-6 May 1982
(Contract DE-AC02-76CH-00016)
(DE82-016219; BNL-31299; CONF-820574-1) Avail: NTIS HC A02/MF A01

The techniques for tracking particles through arbitrary accelerator field configurations to look for dynamical effects that are suggested by various theoretical models are discussed. A major motivation for this type of study is that many of our accelerator projects are based on the use of superconducting magnets which have field imperfections that are larger and of a more complex nature than those of conventional magnets. Questions such as resonances, uncorrectable closed orbit effects, coupling between planes, and diffusion mechanisms all assume new importance. Since, simultaneously, we are trying to do sophisticated beam manipulations such as stacking, high current accelerator, long life storage, and low loss extraction, efficient and accurate tracking programs to proceed with confidence are needed. DOE

N83-28015# Joint Publications Research Service, Arlington, Va.
SPACE PHYSICS STUDIED IN INTERCOSMOS PROGRAM
V. M. Balebanov and A. V. Zakharov *In its* USSR Rept.: Space, No. 21 (JPRS-83430) 9 May 1983 p 20-29 Transl. into ENGLISH from Zemlya i Vselennaya (Moscow), no. 2, Mar. - Apr. 1982 p 15-20 (For primary document see N83-28011 17-12)
Avail: NTIS HC A07

71 ACOUSTICS

Includes sound generation, transmission and attenuation. For noise pollution see *45 Environment Pollution*.

N83-28977 British Broadcasting Corp., Kingswood (England). Engineering Div.
A PRELIMINARY STUDY OF THE INFLUENCE OF ROOM MODE STRUCTURE ON SOUND ABSORPTION
E. W. Taylor May 1983 23 p refs
(BBC-RD-1983/4) Avail: BBC, Kingswood Warren, Tadworth, Surrey, Engl.

An account is given of the structure of room modes in rectangular rooms, leading to the derivation of relationships giving the numbers of the three types of mode which will be present in a rectangular room of given dimensions and for a given range of excitation frequencies. The decay of sound in an enclosure is discussed in terms of the acoustic impedances of the surfaces and the room mode structure, particularly for the case in which the room has uniform surface impedance. The effect of the proportion of each of the three types of room mode on the apparent absorption coefficient of the surface is considered. Comparisons are given between results predicted by this work and those obtained in practice, and also with other theoretical work. Author

N83-28978 Admiralty Marine Technology Establishment, Teddington (England).
THE EFFECT OF UNIFORM FLOW ON THE DYNAMICS AND ACOUSTICS OF FORCE-EXCITED INFINITE PLATES
D. J. Atkins Dec. 1982 56 p refs
(AMTE(N)-TM-82087; BR86583) Copyright. Avail: Issuing Activity

Formulas are obtained for the time-harmonic steady-state plate displacement, acoustic pressure and particle velocities. The far field pressure is obtained from a stationary phase approximation, and two separate formulations are used to define a time-averaged acoustic intensity vector. The stability of a line-excited plate is examined using both a steady-state approach and a causal approach which distinguishes between absolute and convective instability. Numerical results are presented for a steel plate vibrating in water. The far field pressure is not significantly affected by flow speeds of a practical magnitude. The very low-frequency acoustic intensity vectors at the plate surface are affected considerably, but at higher frequencies there is no significant effect. At low speeds a convective instability is found and at higher flow speeds there is an absolute instability. Author (ESA)

N83-28979 Admiralty Marine Technology Establishment, Teddington (England).
FREE-WAVE PROPAGATION IN AND SOUND RADIATION BY LAYERED MEDIA WITH FLOW
W. J. Spicer Dec. 1982 25 p refs
(AMTE(N)-TM-82102; BR86502) Copyright. Avail: Issuing Activity

Layered systems composed of elastic, viscous and acoustic layers bounded by upper and lower acoustic half-spaces were investigated. Uniform subsonic flows may be present in the acoustic layers and half-spaces. The method of dynamic stiffness coupling is used to obtain the system dynamic stiffness matrix which connects spectral displacements and external stresses at the interfaces. Far-field sound radiation and the wavenumbers of free-waves are found from this matrix relation. FORTRAN computer programs were written for a PDP-11/34A computer and used to calculate the far field sound radiation due to a point-source or point-force excitation. Numerical results include wavenumber-frequency plots which exhibit the characteristics of instabilities. Author (ESA)

N83-28980 Admiralty Marine Technology Establishment, Teddington (England).
ACOUSTIC INTENSITY VECTORS INSIDE INFINITE CYCLINDRICAL ELASTIC SHELL
J. H. James Dec. 1982 22 p refs
(AMTE(N)-TM-82103; BR86369) Copyright. Avail: Issuing Activity

Integral transform formulas are given for the time-harmonic acoustic pressure and particle velocities from which the acoustic

intensity vectors in the anterior and exterior fluid may be calculated numerically. Plots of interior intensity vectors due to point-force or point-source excitation demonstrate their potential usefulness as a visual aid to the understanding of wave propagation in fluid-filled pipes. Author (ESA)

N83-28981 Admiralty Marine Technology Establishment, Teddington (England).
SOUND RADIATION FROM A CYLINDRICAL PIPE COMPOSED OF CONCENTRIC LAYERS OF FLUIDS AND ELASTIC SOLIDS
E. A. Kelton Jan. 1983 35 p refs
(AMTE(N)-TM-83007; BR86949) Copyright. Avail: Issuing Activity

A cylindrical pipe composed of a number of concentric layers of elastic solids and fluids was investigated. It is excited by time-harmonic mechanical point forces or acoustic sources. The exact linear equations of elastodynamics, viscodynamics and acoustics are solved to obtain, via the finite element method, a matrix equation which connects interface displacements and external forces in the spectral domain. Far field sound radiation and the wavenumbers of free-waves are obtained from this relation. Numerical results include a comparison of sound radiation levels obtained from the exact theory and a shell theory.
Author (ESA)

N83-28982 Defence Research Information Centre, Orpington (England).
ACOUSTIC EMISSION
M. Asty Jan. 1983 54 p refs Transl. into ENGLISH of Ann. des Mines (France), Dec. 1978 p 51-70
(DRIC-T-6813; BR86888) Copyright. Avail: Issuing Activity

A review of acoustic emission methods is presented. These are considered to be a valuable nondestructive technique to evaluate the effect of stresses on materials. The nature of acoustic emissions are described. Techniques which are most suited to industrial applications are emphasized. Codification attempts by ASME and ASTM are discussed. Author (ESA)

N83-28983# Toronto Univ. (Ontario). Inst. for Aerospace Studies.
EXPERIMENTAL AND ANALYTICAL STUDIES OF SHIELDING CONCEPTS FOR POINT SOURCES AND JET NOISE
Raymond Lee Man Wong May 1983 191 p refs
(UTIAS-266; ISSN-0082-5255) Avail: NTIS HC A09/MF A01

Concepts for jet noise shielding were explored. Model experiments center on solid planar shields, simulating engine-over-wing installations and sugar scoop shields. Tradeoff on effective shielding length is set by interference 'edge noise' as the shield trailing edge approaches the spreading jet. In general, shielding attentuation increases steadily with frequency, following low frequency enhancement by edge noise. Although broadband attenuation is typically only several decibels, the reduction of the subjectively weighted perceived noise levels is higher. Calculated ground contours of peak PN dB (perceived noise level) show a substantial contraction due to shielding: this reaches 66% for one of the sugar scoop shields for the 90 PN dB contour. The experiments are complemented by analytical predictions. They are divided into an engineering scheme for jet noise shielding and more rigorous analysis for point source shielding. A.R.H.

N83-28984*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
PROPELLER NOISE PREDICTION
William E. Zorumski May 1983 61 p refs Presented at the Acoustical Society of America Meeting, Cincinnati, 10 May 1983
(NASA-TM-85636; NAS 1.15:85636) Avail: NTIS HC A04/MF A01 CSCL 20A

Analytic propeller noise prediction involves a sequence of computations culminating in the application of acoustic equations. The prediction sequence currently used by NASA in its ANOPP (aircraft noise prediction) program is described. The elements of the sequence are called program modules. The first group of modules analyzes the propeller geometry, the aerodynamics, including both potential and boundary layer flow, the propeller performance, and the surface loading distribution. This group of modules is based entirely on aerodynamic strip theory. The next group of modules deals with the actual noise prediction, based on data from the first group. Deterministic predictions of periodic thickness and loading noise are made using Farassat's time-domain methods. Broadband noise is predicted by the semi-empirical Schlinker-Amiet method. Near-field predictions of fuselage surface pressures include the effects of boundary layer refraction and (for a cylinder) scattering. Far-field predictions include atmospheric and ground effects. Experimental data from subsonic and transonic propellers are compared and NASA's future direction is propeller noise technology development are indicated. A.R.H.

N83-28985*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
ACOUSTIC MEASUREMENTS OF THE X-WING ROTOR
M. Mosher Jun. 1983 109 p refs
(NASA-TM-84292; A-9080; NAS 1.15:84292) Avail: NTIS HC A06/MF A01 CSCL 20A

Noise measurements of a stoppable X-wing rotor system model, tested in the Ames 40- by 80-foot wind tunnel, are summarized. Performance, control system stability, and noise of the model were investigated at various forward speeds, tip speeds, collective blade angles, jet blowing velocities, and model attack angles. The model was tested in the rotating wing helicopter configuration, in the fixed wing configuration, and in wing configurations between the two. Noise data obtained in the helicopter configuration at the two highest tip speeds (Mach 0.44 and 0.47) and at wind tunnel speeds below 140 knots are reported. Test configuration and performance information are included. General acoustic measurements (dB, dBA, and PNdB) at six microphone locations are presented for all conditions under which the background noise was below the model noise. More specific measurements (1/3-octave and blade passage frequency harmonic levels) are presented for selected conditions. Graphs of dBA and 1/3-octave spectra, which show the noise trends as functions of operating condition, are included. The noise depends mainly on the jet blowing velocity. The noise levels were highest at moderate jet blowing velocities, less at the highest velocity, and lowest with no blowing at all. M.G.

N83-28986*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
ACOUSTIC MEASUREMENTS OF A FULL-SCALE COAXIAL HINGELESS ROTOR HELICOPTER
Randall L. Peterson and Marianne Mosher Jun. 1983 127 p
(NASA-TM-84349; A-9301; NAS 1.15:84349) Avail: NTIS HC A07/MF A01 CSCL 20A

Acoustic data were obtained during a full-scale test of the XH-59A Advancing Blade Concept Technology Demonstrator in the 40- by 80-Foot Wind Tunnel. The XH-59A is a research helicopter with two coaxial rotors and hingeless blades. Performance, vibration, and noise at various forward speeds, rotor lift coefficients and rotor shaft angles of attack were investigated. The noise data were acquired over an isolated rotor lift coefficient range of 0.024 to 0.162, an advance ratio range of 0.23 to 0.45 corresponding to tunnel wind speeds of 89 to 160 knots, and angles of attack from 0 deg to 10 deg. Acoustic data are presented for seven microphone locations for all run conditions where the model noise is above the background noise. Model test configuration and performance information are also listed. Acoustic waveforms, dBA, and 1/3-octave spectra as functions of operating condition for selected data points and microphones are presented. In general, the noise level is shown to increase with rotor lift coefficient except under certain operating conditions where significant impulsive blade/vortex interactions increase noise levels. Author

N83-28987# Technology for Energy, Knoxville, Tenn.
ACOUSTIC MONITORING OF POWER PLANT VALVES
J. W. Allen, W. F. Hartman, and J. C. Robinson Jun. 1982 47 p refs Sponsored by EPRI

(EPRI Proj. 1246-1)
(DE82-905779; EPRI-NP-2444-SY) Avail: NTIS HC A03/MF A01

Advanced surveillance diagnostics were applied to key nuclear power plant valves to improve the availability of the power plant. Two types of valves were monitored: boiling water reactor (BWR) three-stage, pilot-operated safety/relief valves and pressurized water reactor (PWR) feedwater control valves. Excessive leakage across the pilot-disc seat in BWR safety/relief valves can cause the second-stage pressure to reach the critical value that activates the valve, even though the set pressure was not exceeded. Acoustic emission created by the leak noise were monitored and calibrated to indicate incipient activation of the safety/relief valve. Hydrodynamic, vibration, control and process signals frm PWR feedwater control valves were monitored by a mini-computer based surveillance system. DOE

N83-28988# Technology for Energy, Knoxville, Tenn.
ACOUSTIC MONITORING OF POWER-PLANT VALVES Final Report
J. W. Allen, W. F. Hartman, and J. C. Robinson Jun. 1982 335 p Sponsored by EPRI
(EPRI Proj. 1246-1)
(DE82-905282; EPRI-NP-2444) Avail: NTIS HC A15/MF A01

Advanced surveillance diagnostics were applied to key nuclear power plant valves to improve the availability of the power plant. Two types of valves were monitored: BWR three-stage, pilot-operated safety/relief valves and PWR feedwater control valves. Excessive leakage across the pilot-disc seat in BWR safety/relief valves can cause the second-stage pressure to reach the critical value that activates the valve, even though the set pressure was not exceeded. Acoustic emissions created by the leak noise were monitored and calibrated to indicate incipient activation of the safety/relief valve. Hydrodynamic, vibration, control and process signals from PWR feedwater control valves were monitored by a mini-computer based surveillance system. On-line analysis of these signals coupled with earlier analytic modelling identified: (1) cavitation, (2) changes in steam packaging tightness, (3) valve stem torquing, (4) transducer oscillations, and (5) peak vibration levels during power transients. DOE

N83-28989# Idaho National Engineering Lab., Idaho Falls.
NUMERICAL CALCULATIONS OF ULTRASONIC FIELDS. 1: TRANSDUCER NEAR FIELDS
J. A. Johnson Apr. 1982 26 p refs
(Contract DE-AC07-76ID-01570)
(DE82-013806; EGG-IS-5828) Avail: NTIS HC A03/MF A01

A computer code for the calculation of linear acoustic wave propagation in homogeneous fluid and solid materials has been derived from the thermal hydraulics code STEALTH. The code uses finite difference techniques in a two dimensional mesh made up of arbitrarily shaped quadrilaterals. Problems with two dimensional plane strain or two dimensional axial symmetries can be solved. Free, fixed or stressed boundaries can be used. Transducers can be modeled by time dependent boundary conditions or by moving pistons. A brief description of the method is given and the results of the calculation of the near fields of circular flat and focused transducers are shown. These results agree with analytic theory along the axis of symmetry and with other codes that use a Huygens' reconstruction technique off axis. DOE

N83-28990# Max-Planck-Institut fuer Stroemungsforschung, Goettingen (West Germany).
A CUSP CATASTROPHE IN FLOW ACOUSTICS
Ingo Rehberg 1983 129 p refs In GERMAN; ENGLISH summary
(MPIS-Mitt-75; ISSN-0374-1257) Avail: NTIS HC A07/MF A01

Self induced transonic flow oscillations acting as a sound generator in a duct following abrupt enlargement of the cross section are discussed. Increasing duct length decreases frequency up to a critical length (lc) of the duct. If this length is further increased, the frequency jumps to higher values. This jump is accompanied by hysteresis. Decreasing the duct length leads to a jump to the lower frequency at a length lc1 < lc. This is simulated by two mathematical models. The transonic oscillator is represented by a nonlinear equation leading to oscillations, and the duct is represented by a term including a time lag. It is shown that the hysteresis vanishes if the sound reflection at the end of the duct is decreased below a certain critical value. This behavior can be interpreted as a cusp catastrophe of an oscillating system. Author (ESA)

N83-28991# Battelle Inst., Frankfurt am Main (West Germany).
NOISE REDUCTION OF PNEUMATIC NAILERS OF UP TO 8 BAR WORKING PRESSURE, CONSIDERING HANDLING PROPERTIES AND SERVICE LIFE Final Report, Apr. 1980
Wolfgang Damberg, Karl Floegel, and Alois Sahm Bonn Bundesministerium fuer Forschung und Technologie Feb. 1983 80 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-HA-83-004; ISSN-0171-7618) Avail: NTIS HC A05/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 17

A noise reduction device for pneumatic nailers was developed. Conditions of use, range of products available, market regulations and measuring methods were studied. Ease of operation, service life, functional reliability and maintenance capacity were studied. Results show that the essential noise sources of the device are the compressed air blasts of the working and relation phases and the impact of the piston on the bumper. Packages of measures implemented on a laboratory scale indicate noise reduction possibilities for nailers in the short, medium and long term. The sound level of a single shot can be reduced from 110 dB to 93 dB. Author (ESA)

N83-28992# European Space Agency, Paris (France).
GROUND REFLECTION EFFECTS IN MEASURING PROPELLER AIRCRAFT FLYOVER NOISE
Werner Dobrzynski Sep. 1982 92 p refs Transl. into ENGLISH of "Interferenzwirkungen durch Bodenreflexion bei Fluglaermmessungen an Propellerflugzeugen" DFVLR Rept. DFVLR-FB-81-28 DFVLR, Brunswick, West Germany, Aug. 1981 Original report in GERMAN previously announced as N82-22990
(ESA-TT-742; DFVLR-FB-81-28) Avail: NTIS HC A05/MF A01; original German version available from DFVLR, Cologne DM 21

The influence of ground reflection on the maximum A-weighted aircraft noise level was investigated. Depending on propeller rotational speed and number of blades ground-reflection causes level differences of up to 3 dB(A). Since reflection corrections cannot successfully be applied to propeller noise signatures, alternative measuring arrangements such as microphones in close proximity to the ground were assessed. Depending on the positioning of the microphone in relation to an even, reverberant ground surface, or above ground plates, in the case of grass-covered surfaces, frequency ranges not affected by ground-reflection interferences are determined. Author (ESA)

N83-28993# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany). Abteilung Technische Akustik.
PROPELLER AIRCRAFT NOISE CERTIFICATION AND FLIGHT TESTING
Hanno Heller Oct. 1982 126 p refs
(DFVLR-Mitt-82-16) Avail: NTIS HC A07/MF A01; DFVLR, Cologne DM 46,90

The ICAO Annex 16 International Standards and Recommended Practices, Vol. 1 Aircraft Noise, 1981 Edition is discussed. The experience gained in the application of these Standards specifically for propeller aircraft over a period of more than 10 years is evaluated. Propeller aircraft testing procedures for purposes other than certification, through overflight flyby and ground static noise measurements are also discussed. Author (ESA)

72 ATOMIC AND MOLECULAR PHYSICS

Includes atomic structure and molecular spectra.

N83-28994 Texas Univ., Austin.
RF CURRENT GENERATION NEAR THE ION CYCLOTRON FREQUENCY Ph.D. Thesis
Jonathan George Watkins 1982 106 p
Avail: Univ. Microfilms Order No. DA8227739

An experiment was conducted to measure unipolar currents driven by directional radio frequency waves in a cylindrical plasma mirror machine near the ion cyclotron frequency. The directional waves were launched using a four phase helical coupler which allowed the selection of both azimuthal mode number ($m = +1$) and direction of wave propagation. Plasma diagnostics include electron density measurements (4mm microwave interferometer), electron temperature measurements (floating double probe), wave amplitude and coupling measurements (magnetic probes), RF power measurements (RF voltage and current probes) and RF driven plasma current measurements (Rogowski loops and current transformers). Theoretical work includes an analytic approximation to the nonlinear problem of a particle in a traveling wave and computer simulations that extend this result. Nonlinear particle drifts other than trapping were found both with and without the presence of particle collisions. Dissert. Abstr.

N83-28995*# Ohio State Univ., Columbus. Dept. of Physics.
LABORATORY INFRARED STUDIES OF MOLECULES OF ATMOSPHERIC AND ASTROPHYSICAL INTEREST
N. Narahari Rao Oct. 1982 244 p refs
(Grant NsG-2175)
(NASA-CR-166494; NAS 1.26:166494) Avail: NTIS HC A11/MF A01 CSCL 20H

Nineteen reprints on the molecular species are compiled. Much of the work was done by using the Doppler-limited resolution provided by diode lasers. The diode laser was used as a source to a grating spectrometer which has been used earlier for high resolution studies. This technique provided many advantages. Wherever possible, the studies have been directed to intensity determinations of infrared bands. Author

N83-28996*# Naval Research Lab., Washington, D. C. Geophysical and Plasma Dynamics Branch.
FINITE WIDTH CURRENTS, NON-UNIFORM MAGNETIC SHEAR AND THE CURRENT DRIVER ION CYCLOTRON INSTABILITY
P. Bakshi (Boston College, Chestnut Hill, Mass.), G. Ganguli (Science Applications, Inc., McLean, Va.), and P. Palmadesso 17 Mar. 1983 14 p ref
(RR0330244)
(NASA-CR-170365; NAS 1.26:170365; AD-A125750; NRL-MR-5034) Avail: NTIS HC A02/MF A01 CSCL 20G

Our earlier results that non-local effects due to even a small magnetic shear produce a significant reduction of the growth rate of the ion cyclotron instability driven by a uniform current are now generalized to finite width currents. Externally prescribed as well as self-consistent shears are considered. If the current width Lc exceeds the shear length Ls, the previous results are recovered. Shear becomes less effective with reduction of Lc, and for typical parameters, the growth rate attains its (shearless) local value for Lc/Ls approximately less than 10 to the minus 2. Non-local effects of the finite current width itself come into play if Lc is further reduced to a few ion Larmor radii and can quench the instability. GRA

N83-28997# Texas Univ., Arlington. Dept. of Physics.
PROCEEDINGS OF THE 6TH INTERNATIONAL CONFERENCE ON POSITRON ANNIHILATION: PROGRAM AND COLLECTED ABSTRACTS Final Report, Jan. - Nov. 1982
P. G. Coleman, S. C. Sharma, and L. M. Diana 23 Feb. 1983 339 p refs Proc. held in Arlington, Texas, 3-7 Apr. 1982
(Grant N00014-82-G-0002)
(AD-A125610) Avail: NTIS HC A15/MF A01 CSCL 20/8

Low energy positron annihilation measurements have been used widely in solid state physics, materials science, atomic and molecular physics and chemistry, radiation chemistry, and medicine. This Conference marked the fiftieth anniversary of the discovery of the positron by Carl Anderson, and the Opening Address was delivered by Professor Martin Deutsch of M.I.T., who discovered positronium about thirty years ago. Thirty one invited papers were presented covering all fields in which positron annihilation is used. 270 contributed papers were presented in oral and poster sessions. Of particular interest at this, the sixth conference in this series, was the emergence of monoenergetic positron beams as important tools in the study of fundamental processes and of the surface properties of materials. GRA

N83-28998# California Univ., Livermore. Lawrence Livermore Lab.
CALCULATION OF A TRACKING FORCE
Edward P. Lee 10 Jan. 1983 11 p ref
(Contract W-7405-eng-48)
(DE83-006669; UCID-19674) Avail: NTIS HC A02/MF A01

The original calculation of an electromagnetic mechanism for beam channel tracking is presented. The system model is not realistic because only a flat profile channel which completely encloses the beam is considered. A clear demonstration of the existence of a tracking force is made, as a point of departure for the more recent studies which incorporate a realistic model of the beam head and conductivity profile. DOE

N83-28999# Harvard Univ., Cambridge, Mass. Dept. of Physics.
EXPERIMENTAL CONSIDERATIONS FOR A SENSITIVE NEUTRON-ANTINEUTRON OSCILLATION SEARCH
M. S. Goodman, R. Wilson, H. O. Cohn, T. A. Gabriel, R. A. Lillie, P. D. Miller, W. M. Bugg, G. T. Condo, T. Handler, and E. L. Hart 1982 17 p refs Presented at Intern. Colloq. on Baryon Nonconserv., Bombay, 11 Jan. 1982
(Contract W-7405-eng-26)
(DE82-011516; CONF-820135-1) Avail: NTIS HC A02/MF A01

The experimental considerations for the design of an experiment to search for neutron-antineutron mixing are presented. A comparison of free-neutron sources leads to the choice of a reactor facility based on the ORR reactor at the Oak Ridge National Laboratory as the facility with the largest Nt squared. A proposed experiment to measure the antineutron annihilation signature is described. Features of the design of he experiment, including a 20-m evacuated magnetically shielded flight path, a detector sensitive to energy and particle multiplicity, and an active cosmic ray shield and anticoincidence, are presented. A brief status report of studies currently in progress, including both detector tests at a reactor facility and computational modeling, is given. DOE

N83-29000# Sandia Labs., Albuquerque, N. Mex.
CHERENKOV LIGHT AS A CURRENT-DENSITY DIAGNOSTIC FOR LARGE-AREA, REPETITIVELY PULSED ELECTRON BEAMS
M. Buttram and R. Hamil 1983 4 p refs Presented at the Particle Accelerator Conf., Santa Fe, N. Mex., 21 Mar. 1983
(Contract DE-AC04-76DP-00789)
(DE83-009193; SAND-83-0514C; CONF-830311-10) Avail: NTIS HC A02/MF A01

Cherenkov light intensity is an ideal electron beam current density diagnostic, giving information about the beam's spatial distribution as a function of time during a pulse. It is free of the fluorescence and saturation often observed in scintillators provided a suitable radiator is chosen. Plate glass was used for single pulse applications. For repetitively pulsed beams a flowing liquid radiator is used to reduce problems arising from heating and decomposition of the material. Light output is sufficient to study 1 A/cm(2), 250 kV beams with ASA 3000 speed film. Streak photography also appears possible. DOE

N83-29001# Sandia Labs., Albuquerque, N. Mex. Pulsed Power Applications Dept.
MULTISTAGE PULSED-POWER ELECTRON ACCELERATORS

K. R. Prestwich, D. E. Hasti, R. B. Miller, and A. W. Sharpe 1983 5 p refs Presented at the Particle Accelerator Conf., Santa Fe, N. Mex., 21 Mar. 1983
(Contract DE-AC04-76DP-00789)
(DE83-009165; SAND-82-2453C; CONF-830311-7) Avail: NTIS HC A02/MF A01

Pulse-power developments in high-current linear accelerators (RADLAC I) and low-impedance water transmission lines (PBFA I) are reviewed. The design of Hermes III, a 1.1-MA, 15-MV linear accelerator based on these technologies is discussed and initial data on the development of this accelerator is presented. DOE

N83-29002# Sandia Labs., Albuquerque, N. Mex.
TEMPERATURE DEPENDENCE OF ELECTRON-BOMBARDMENT-ENHANCED REACTIVITY OF DIFFERENT TYPES OF GRAPHITE
Carol I. H. Ashby 1982 19 p refs Presented at the 5th Intern. Conf. on Plasma Surface, Gatlinbury, Tenn., 3-5 May 1982
(Contract DE-AC04-76DP-00789)
(DE82-014089; SAND-82-0055C; CONF-820545-5) Avail: NTIS HC A02/MF A01

Methane yield enhancements due to simultaneous electron bombardment of graphite reacting with atomic hydrogen were studied in the temperature range 300 to 820 K for incident electron energies from 40 to 210 eV. From 300 to 600 K, relatively small changes in yield enhancements are observed as temperature is varied, with values of the order of 0.001 to 0.01 CH4/electron observed. Above 600 K, methane yield enhancements are greater 0.01 to 0.1 CH4/electron) and increase with temprature up to the highest temperature studied, 820 K. Both thermal reaction rates and electron yield enhancements are strongly dependent on the reaction history of the sample, with significantly higher values for fresh surfaces than for reacted surfaces. Overestimation of wall erosion is possible if rates derived from samples are used for calculating long term erosion. C2-hydrocarbon production increases relative to CH4 production as temperature increases and is also enhanced by electron bombardment. Papyex and POCO graphites exhibit similar behavior, while oriented pyrolytic graphite exhibits some differences. DOE

N83-29003# Argonne National Lab., Ill. Materials Science Div.
THEORY OF CORRELATION EFFECTS IN DIFFUSION
Dieter Wolf 1982 32 p refs Presented at the NATO Advan. Study Inst. Conf. on Mass Transport in Solids, Lannion, France, 27 Jun. 1982
(Contract W-31-109-eng-38)
(DE83-008493; CONF-8206170-1) Avail: NTIS HC A03/MF A01

Among the three diffusion models considered only the combination of mono- and divacancies permits a self-consistent interpretation of the NMR and tracer results. In the temperature range investigated (150-280K) the mechanisms of Gilder and Lazarus and Da Fano and Jacucci involving monovacancies alone appear to play a minor role only. At higher temperatures the most likely mode of divacancy motion favors 2n and 4n divacancy configurations over in configurations while at lower temperatures in configurations may play an important part in the diffusion process. These basic conclusions concerning the diffusion mechanism in sodium have been obtained independently very recently by means of quasielastic neutron scattering by Boeltz ,et al, for temperatures between 323K and the melting point, a temperature range which does not overlap with the range accessible to NMR relaxation experiments. DOE

N83-29004# Du Pont de Nemours (E. I.) and Co., Aiken, S.C. Actinide Technology Div.
COMPARATIVE RISK ASSESSMENTS FOR THE PRODUCTION AND INTERIM STORAGE OF GLASS AND CERAMIC WASTE FORMS: DEFENSE WASTE PROCESSING FACILITY
Ju-Chrong Huang and W. Victor Wright Apr. 1982 145 p refs
(Contract DE-AC09-76SR-00001)
(DE82-014169; DPST-82-327) Avail: NTIS HC A07/MF A01

The Defense Waste Processing Facility (DWPF) for immobilizing nuclear high level waste (HLW) is scheduled to be built. High level waste is produced when reactor components are subjected to chemical separation operations. Two candidates for immobilizing this HLW are borosilicate glass and crystalline ceramic, either being contained in weld sealed stainless steel canisters. A number of technical analyses are being conducted to support a selection between these two waste forms. The risks associated with the manufacture and interim storage of these two forms in the DWPF are compared. Process information used in the risk analysis was taken primarily from a DWPF processibility analysis. The DWPF environmental analysis provided much of the necessary environmental information. DOE

N83-29005# Princeton Univ., N. J. Plasma Physics Lab.
MULTI-MeV Li(0) BEAM AS A DIAGNOSTIC FOR FAST CONFINED ALPHA PARTICLES
L. R. Grisham, D. E. Post, and D. R. Mikkelsen Apr. 1982 27 p refs
(Contract DE-AC02-76CH-03073)
(DE82-009821; PPPL-1886) Avail: NTIS HC A03/MF A01

A method of measuring the velocity distribution of confined energetic alpha particles resulting from deuterium-tritium fusion reactions in a magnetically contained plasma is discussed. We calculate the characteristics of the signals to be expected from injecting multi-MeV LiO into the plasma to undergo double charge-exchange reactions with the alpha particles. Neutralized alpha particles then escape from the plasma to be detected by a charge-exchange analyzer. The feasibility of producing a LiO beam of the required current and energy is also examined, and we discuss a conceptual design for an appropriate beam system is discussed. DOE

N83-29006# Brookhaven National Lab., Upton, N. Y.
THE LILA: THE LONG ISLAND LATTICE ANALOGUE
J. Niederer and B. Morris 1982 6 p refs Presented at Workshop on Accelerator Orbit and Particle Tracking Programs, Upton, N.Y., 3 May 1982
(Contract DE-AC02-76CH-00016)
(DE82-017273; BNL-31370; CONF-820574-4) Avail: NTIS HC A02/MF A01

LILA is a BNL adventure to create a particle orbit and tracking program ensemble for large storage ring accelerator design and also controls operation. The accelerator physics parts are based largely on the PATRICIA program of H. Weidemann, as enhanced by S. Kheifets in a later version with multipole effects. We have emphasized the data base aspects of the tracking problem, as modern storage rings contain thousands of distinct lattice items, each with perhaps up to fifty parameters of its own. We have also introduced the general and flexible program structures long familiar to high energy physics event analysis, by which an event is reconstructed in steps from points into lines, projections into tracks, tracks to vertices and the like. Thus, LILA is a modern amalgam of the original PATRICIA, a relational data base and memory management mechanism, and a number of enhancements for treating nonlinear forces. DOE

N83-29007# Brookhaven National Lab., Upton, N. Y.
PARTICLE IDENTIFICATION WITH A FINE-SAMPLING IONIZATION-LOSS DETECTOR
T. Ludlum, E. D. Platner, V. A. Polychronakos, S. J. Lindebaum, E. Rosso (European Organization for Nuclear Research), P. Queru (European Organization for Nuclear Research), M. A. Kramer (City Coll. of the City Univ. of New York), Y. Teramoto (City College Coll. of the City Univ. of New York), T. Akesson (Lund Univ.), and G. Jarlskog (Lund Univ.) 1982 6 p refs Presented at Intern. Conf. on Instr. for Colliding Beam Phys., Stanford, Calif., 17-23 Feb. 1982
(Contract DE-AC02-76CH-00016)
(DE82-012739; BNL-31122; CONF-820237-5) Avail: NTIS HC A02/MF A01

In a recent series of tests it has been shown that the sensitivity for charged particle identification via the relativistic rise in ionization loss can be enhanced by using longitudinal drift and fast electronics to effect very small sampling intervals. With the chamber geometry

illustrated (i.e., operation in the time expansion mode) electrons from individual ionizing collisions drift sequentially onto the anode wire with a time structure determined by the drift velocity in the gas. After fast pulse shaping the resultant waveform is digitized with a lash-encoding ADC at a frequency of 100MHz. The results of these initial tests are summarized as a function of the sample size. The result achieved with 1 meter of conventional sampling is shown for comparison. For large sample sizes the results are comparable to those of traditional techniques, and a significant improvement is achieved when the sampling frequency is increased by roughly an order of magnitude. These results were gotten with a small test chamber in which meter-long tracks were simulated by piecing together many traversals of a single drift gap. DOE

N83-29008# Brookhaven National Lab., Upton, N. Y.
NEAR-FIELD ACCELERATORS
R. B. Palmer 1982 11 p Presented at the Workshop on Laser Acceleration of Particles, Los Alamos, N. Mex., 18-23 Feb. 1982
(Contract DE-AC02-76CH-00016)
(DE82-017277; BNL-31393; CONF-820241-8) Avail: NTIS HC A02/MF A01

The Workshop made enormous gains in our understanding. Many scaling laws of linac behavior with wavelength were defined, some probably for the first time. A comparison was made between a conventional and grating linac, also probably for the first time. A problem in transverse stability of the grating accelerator was exposed but also solved at the workshop with a great net gain understanding. Loading of linacs appears not to be independent on wavelength, it had not previously been studied for a laser accelerator. The limits on accelerating field as a function of wavelength were studied. A gain of a factor of 10 is likely if the wavelength can be reduced to the 1 cm range. After that the gains are small unless it is acceptable to destroy the structure. If this is allowed, as could be the case for a grating consisting of liquid ripples, then plasma development will limit the fields. A first alculation suggests that very high gradients may be attainable. The most remarkable feature of laser driven grating accelerators are the low RF energies required to attain high beam energies for a few particles. One example is of a 1 TeV accelerator driven by a 60 Joule laser. DOE

N83-29009# Los Alamos Scientific Lab., N. Mex.
LAMPF 2: ALSO A HYPERON FACTORY
T. W. L. Sanford Jun. 1982 15 p refs
(Contract W-7405-eng-36)
(DE82-019190; LA-9386-MS) Avail: NTIS HC A02/MF A01

The possibility of generating large numbers of hyperons via an intense 4.5 GeV/cK- beam at LAMPF II is explored. The advantage of using a K- beam over that of using a pi beam is examined. Hyperon fluxes and backgrounds are estimated and compared with those available from existing hyperon beams. Production mechanisms are briefly discussed. DOE

N83-29010# Los Alamos Scientific Lab., N. Mex.
A QUARK-MODEL CALCULATION OF THE WEAK-PARITY-VIOLATING ASYMMETRY IN PROTON-NUCLEON SCATTERING
T. Goldman and Dean Preston 1982 17 p refs Presented at the 21st Intern. Conf. on High Energy Phys., Paris, 29 Jul. 1982
(Contract W-7405-eng-36)
(DE82-017595; LA-UR-82-1886; CONF-820718-1) Avail: NTIS HC A02/MF A01

Quark model calculations are discussed. It was found that quark model calculations tend to produce large (approximately 10 to the minus 6th power) values for the parity violating asymmetry in polarized proton-unpolarized nucleon scattering. L.F.M.

N83-29011# California Univ., Berkeley. Lawrence Berkeley Lab. Nuclear Science Div.
PARTICLE ANGULAR DISTRIBUTIONS AND GAMMA-RAY MULTIPLICITIES AS EXPERIMENTAL PROBES FOR ANGULAR-MOMENTUM FLUCTUATIONS
L. G. Moretto Mar. 1982 65 p refs Presented at the 20th Intern. Meeting on Nucl. Phys., Bormio, Italy, 25 Jan. 1982
(Contracts W-7405-eng-48; DE-AC03-76SF-00098)
(DE82-014439; LBL-14101; CONF-820149-1) Avail: NTIS HC A04/MF A01

The sequential emission of He(4) is demonstrated in the reaction Ho + Ta and the He(4) angular distribution is used to test the rigid rotation limit in the reaction Ho + Ag. A more refined analysis of the dependence of continuum gamma ray multiplicities upon Q-value and gamma ray energy shows that reasonable agreement with the statistical model is obtained if one assumes the presence of low energy aligned dipole transitions in the reactions Ho, Yb, Sm, Ag + Ho. Sequential fission angular distributions from very asymmetric reactions U, Au + Ne provide a severe test for the statistical model. DOE

N83-29012# Pacific Northwest Lab., Richland, Wash.
ENERGY DEPOSITED BY CHARGED PARTICLES
W. E. Wilson, J. H. Miller, and L. H. Toburen Apr. 1982 7 p Presented at the 15th Ann. Radiological Phys. Contractors' Meeting, Gettysburg, Pa., 4 May 1982
(Contract DE-AC06-76RL-01830)
(DE82-014850; PNL-SA-10393; CONF-820585-4) Avail: NTIS HC A02/MF A01

To characterize the absorption of ionizing radiations in matter on a size scale of macro molecular dimensions (nanometers), a computer code MOCA13 was devised. This improved code provides a high degree of detail in positive ion track simulation based on vapor phase interaction cross sections. DOE

N83-29013# Argonne National Lab., Ill.
HIGH-SPIN RESONANCES IN HEAVY-ION COLLISIONS
R. R. Betts and S. Saini 1982 18 p refs Presented at the Nordic Meeting on Nucl. Phys., Fuglespoentret, Denmark, 16-20 Aug. 1982
(Contract W-31-109-eng-38)
(DE83-007800; CONF-820896-6) Avail: NTIS HC A02/MF A01

Excitation functions for elastic scattering and reactions of (28)Si + (28)Si show evidence for the existence of narrow (GAMMA = 100 to 200 keV) high-spin (J approx. = 40 Pi) resonances. The interpretation of these resonances as high-spin fissioning shape isomers is discussed with reference to data for the (28)Si + (30)Si and (30)Si + (30)Si systems. DOE

N83-29014# California Univ., Livermore. Lawrence Livermore Lab.
INVESTIGATION OF GLASS STRUCTURE USING FLUORESCENCE LINE NARROWING AND MOLECULAR DYNAMICS SIMULATIONS
M. J. Weber and S. A. Brawer 2 Jul. 1982 14 p refs Presented at the 5th Intern. Conf. on Phys. of Non-Crystalline Solids, Montpellier, France, 5-9 Jul. 1982
(Contract W-7405-eng-48)
(DE82-018421; UCRL-87777; CONF-820720-1) Avail: NTIS HC A02/MF A01

The local structure at individual ion sites in simple and multicomponent glasses is simulated using methods of molecular dynamics. Computer simulations of fluoroberyllate glasses predict a range of ion separations and coordination numbers that increases with increasing complexity of the glass composition. This occurs at both glass forming and glass modifying cation sites. Laser-induced fluorescence line-narrowing techniques provide a unique probe of the local environments of selected subsets of ions and are used to measure site to site variations in the electronic energy levels and transition probabilities of rare earth ions. These and additional results from EXAFS, neutron and X-ray diffraction, and NMR experiments are compared with simulated glass structures. DOE

N83-29015# Max-Planck-Institut fuer Stroemungsforschung, Goettingen (West Germany).
SCATTERING CROSS SECTIONS FOR ROTATIONAL EXCITATION OF N2, O2, AND CH4 MOLECULES IN COLLISIONS WITH He ATOMS Thesis [STREUQUERSCHNITTE FUER DIE ROTA-

TIONSANREGUNG VON N2, O2, UND CH4 DURCH STOESSE MIT He-ATOMEN]
K.-H. Kohl Dec. 1982 120 p refs In GERMAN
(MPIS-17/1982; ISSN-0436-1199) Avail: NTIS HC A06/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 21

The decomposition of an energy dissipation spectrum was studied using two crossed neutral molecular beams. Scattering of a nearly monochromatic helium atomic beam gives rotary transitions with 1 meV energy difference. The measure of collisions between He and excited rotary states of N2, O2, and H4 as separated transitions in a flight path spectrum over a large angular range is obtained. Together with the angular distribution of the scattered intensity, the flight path spectrum provides relative, double, differential efficiency cross sections, that show diffraction oscillations of angular dependance in all cases. Comparison of measured results with theoretical calculated differential cross sections in accordance with the exact close-coupling method shows good conformity. Author (ESA)

73 NUCLEAR AND HIGH-ENERGY PHYSICS

Includes elementary and nuclear particles; and reactor theory.

For space radiation see *93 Space Radiation.*

N83-29016# Department of Energy, Idaho Falls, Idaho.
ENVIRONMENTAL AND OTHER EVALUATIONS OF ALTERNATIVES FOR MANAGEMENT OF DEFENSE TRANSURANIC WASTE AT THE IDAHO NATIONAL ENGINEERING LABORATORY, VOLUME 1
Apr. 1982 314 p refs 2 Vol.
(DE82-018404; IDO-10103-Vol-1) Avail: NTIS HC A14/MF A01

The DOE is formulating a program for the long-term management of transuranic (TRU) waste buried and stored at the Idaho National Engineering Laboratory (INEL). Results of environmental and other evaluations are presented for three decisions that the DOE is considering: (1) the selection of a general method for the long-term management of the buried TRU waste; (2) the selection of a method for processing the stored waste and for processing the buried waste, if it is retrieved; (3) the selection of a location for the waste-processing facility. Only contact-handled TRU waste buried in pits and trenches and the contact-handled TRU waste held in aboveground storage at the INEL are involved. DOE

N83-29017# Pacific Northwest Lab., Richland, Wash.
WASTE/ROCK INTERACTIONS TECHNOLOGY PROGRAM: THE STATUS OF RADIONUCLIDE SORPTION-DESORPTION STUDIES PERFORMED BY THE WRIT PROGRAM
R. J. Serne and J. F. Relyea Apr. 1982 90 p refs
(Contract DE-AC06-76RL-01830)
(DE82-013874; PNL-3997) Avail: NTIS HC A05/MF A01

The most credible means for radionuclides disposed as solid wastes in deep geologic repositories to reach the biosphere is through dissolution of the solid waste and subsequent radionuclide transport by circulating ground water. Thus safety assessment activities must consider the physiochemical interactions between radionuclides present in ground water with package components, rocks and sediments since these processes can significantly delay or constrain the mass transport of radionuclides in comparison to ground water movement. Interactions between dissolved radionuclides in ground water and rocks and sediments away from the near field repository are emphasized. The primary mechanism discussed is adsorption-desorption, which was studied using two approaches. Empirical studies of adsorption-desorption rely on distribution coefficient measurements while mechanism studies strive to identify, differentiate and quantify the processes that control nuclide retardation. DOE

N83-29018# Rockwell International Corp., Richland, Wash.
ENGINEERED WASTE PACKAGE CONCEPTS FOR HIGH-LEVEL WASTE ISOLATION IN BASALT
Michael J. Smith Jun. 1982 4 p ref Presented at the American Nuclear Society Ann. Meeting, Los Angeles, 6 Jun. 1982
(Contract DE-AC06-77RL-01030)
(DE82-011003; RHO-BW-SA-203-P; CONF-820609-17) Avail: NTIS HC A02/MF A01

The Basalt Waste Isolation Project (BWIP) is charged with determining the feasibility of permanently storing commercial high level radioactive wastes in a geologic repository located in the basalt underlying the Hanford Site. The results of the BWIP efforts are presented to more clearly define the environmental, regulatory, and performance factors that influence the development of waste package design criteria for a basalt medium. A technique for developing performance and design criteria based on the favorable environmental characteristics (low Eh, moderate pH, low ionic strength groundwater) of the basalts beneath the Hanford Site are discussed. These site-specific considerations were utilized to greatly reduce the complexity and hence the cost of waste packages for basalt. The techniques employed in this analysis are applicable to other systems for which sufficient site-specific data exists. DOE

N83-29019# Rockwell International Corp., Richland, Wash.
APPLICATION OF SYSTEMS ANALYSIS TO DEVELOP ENGINEERED-SYSTEMS PERFORMANCE REQUIREMENTS FOR A HARD-ROCK NUCLEAR-WASTE REPOSITORY
P. F. Salter, W. J. Anderson, and R. A. Deju 1982 17 p refs Presented at the Waste Management Conf., Tucson, Ariz., 3-11 Mar. 1982
(Contract DE-AC06-77RL-01030)
(DE82-012326; RHO-BW-SA-210-P; CONF-820303-35) Avail: NTIS HC A02/MF A01

The Basalt Waste Isolation Project developed a systems analysis approach to establishing performance requirements for the engineered system of a geologic nuclear waste repository. These requirements assure that the engineered system is designed to complement the natural system. This approach results in the optimal design for the engineered system by reducing the functional requirements of that system. While applied only to the basalt system at this time, this approach is applicable to any geologic system. As an example, the systems analysis approach has been applied to the problem of establishing performance requirements for a waste package in basalt and has resulted in the design of a less-complex, more cost-efficient waste package for a nuclear waste repository in basalt. The importance of developing site specific rather than generic waste packages is demonstrated.DOE

N83-29020# Enviro Control, Inc., Rockville, Md.
FIELD-SIMULATION ANALYSIS FOR DISPOSAL OF LIQUEFACTION SOLID WASTE Quarterly Technical Progress Report
14 May 1982 65 p refs
(Contract DE-AC22-81PC-42682)
(DE82-017688; DOE/PC-42682/T2; QTPR-2) Avail: NTIS HC A04/MF A01

Several leaching test methods that can be used to generate inputs into the field simulation models are identified. Recommendations as to those most suited for use with coal liquefaction wastes are made. A number of general considerations for classifying sites and situations prior to model selection are presented. Also, the general categories of models are discussed. DOE

N83-29021# Westinghouse Electric Corp., Mercury, Nev. Advanced Energy Systems Div.
COMMERCIAL NUCLEAR WASTE RESEARCH AND DEVELOPMENT PROGRAM Quarterly Report, Jan. - Mar. 1982
A. R. Hakl Apr. 1982 21 p
(Contract DE-AC08-82NV-10250)
(DE82-016041; DOE/NV-10250/2) Avail: NTIS HC A02/MF A01

The Westinghouse Advanced Energy Systems Division Nevada Operations, under contract to the US Department of Energy, provides trained personnel and services at the E-MAD Facility required for nuclear materials handling, packaging, data gathering,

and other related activities in support of the Commercial Nuclear Waste Research and Development Programs. Support is provided to research programs, including: Waste packaging experiments, spent fuel test - Climax (SFT-C), Hanford Near Surface Test Facility (NSTF), Tests of spent reactor fuel interim handling and storage, tests to assess safety of transport systems for spent reactor fuel and solidified high level nuclear waste, and other special waste package development and handling tests as requested by the DOE. Activities reported were performed to meet subtask objectives of the Nevada Nuclear Waste Storage Investigation (NNWSI) planning documentation for Fiscal Year 1982. DOE

N83-29022# Department of Energy, Richland, Wash.
SPENT-FUEL STORAGE REQUIREMENTS
Jun. 1982 85 p refs Updates DOE/SR-0007
(Contract DE-AC06-76RL-01830)
(DE82-019411; DOE/RL-82/1; DOE/SR-0007) Avail: NTIS HC A05/MF A01

Spent fuel storage requirements, as projected through the year 2000 for U.S. LWRs, were calculated using information supplied by the utilities reflecting plant status as of December 31, 1981. Projections through the year 2000 combined fuel discharge projections of the utilities with the assumed discharges of typical reactors required to meet the nuclear capacity of 165 GWe projected by the Energy Information Administration for the year 2000. Three cases were developed and are summarized. A reference case, or maximum at-reactor capacity case, assumes that all reactor storage pools are increased to their maximum capacities as estimated by the utilities for spent fuel storage utilizing currently licensed technologies. The reference case assumes no transshipments between pools except as current licensed by the Nuclear Regulatory Commission. This case identifies an initial requirement for 13 MTU of additional storage in 1984, and a cumulative requirement for 14,490 MTU additional storage in the year 2000. DOE

N83-29023# California Univ., Livermore. Lawrence Livermore Lab.
THE FUSION BREEDER
Ralph W. Moir 20 Apr. 1982 59 p refs Presented at the National Science Foundation Policy Workshop on End-Use Products of Fusion Energy: Alternatives and Their Implications to the Fusion R and D Strategy, Washington, D.C., 4-5 Mar. 1982
(Contract W-7405-eng-48)
(DE82-013794; UCRL-87290-Rev-1; CONF-820351-1-Rev-1) Avail: NTIS HC A04/MF A01

The fusion breeder is a fusion reactor designed with special blankets to maximize the transmutation by 14 MeV neutrons of uranium 238 to plutonium or thorium to uranium 33 for use as a fuel for fission reactors. Breeding fissile fuels has not been a goal of the US fusion energy program. This paper suggests that it is time for a policy change to make the fusion breeder a goal of the fusion program and the nuclear energy program. This paper suggests this policy change be made and tells why it should be made. It outlines specific research and development goals so that the fusion breeder will be developed in time to meet fissile fuel needs. DOE

N83-29024# Brookhaven National Lab., Upton, N. Y. Dept. of Nuclear Energy.
NUCLEAR-WASTE-MANAGEMENT TECHNICAL SUPPORT IN THE DEVELOPMENT OF NUCLEAR-WASTE-FORM CRITERIA FOR THE NRC. TASK 1: WASTE PACKAGE OVERVIEW, VOLUME 1
R. Dayal, B. S. Lee, R. J. Wilke, K. J. Swyler, P. Soo, T. M. Ahn, N. S. McIntyre, and E. Veakis Feb. 1982 430 p refs
(Contract DE-AC02-76CH-00016)
(DE82-009990; NUREG/CR-2333-Vol-1; BNL-NUREG-51458-Vol-1) Avail: NTIS HC A19/MF A01

The state of waste package development for high level waste, transuranic waste, and spent fuel is assessed. Research on various waste forms, container materials and backfills is reviewed and those which are likely to perform most satisfactorily in the repository environment are identified. Radiation effects on the waste package components are reviewed and the magnitude of these effects are identified. Areas requiring further research are identified. The important variables affecting radionuclide release from the waste package are described and an evaluation of regulatory criteria for high level waste and spent fuel is presented. Finally, for spent fuel, high level, and TRU waste, components which could be used to construct a waste package having potential to meet NRC performance requirements are described and identified. DOE

N83-29025# Los Alamos Scientific Lab., N. Mex.
NEVADA NUCLEAR WASTE STORAGE INVESTIGATIONS: EXPLORATORY SHAFT
D. C. Nelson and T. J. Merson Jun. 1982 230 p refs
(Contract W-7405-eng-36)
(DE82-019496; LA-9179-MS) Avail: NTIS HC A11/MF A01

It is proposed that an Exploratory Shaft (ES) be constructed in Yucca Mountain on or near the southwest portion of the Nevada Test Site (NTS) as part of the Nevada Nuclear Waste Storage Investigations. This document described a conceptual design for an ES and a cost estimate based on a set of construction assumptions. Included in this document are appendixes consisting of supporting studies done at NTS by Fenix and Scisson, Inc. and Holmes and Narver, Inc. These appendixes constitute a history of the development of the design and are included as part of the record. DOE

N83-29026# Los Alamos Scientific Lab., N. Mex.
LOS ALAMOS TRANSURANIC WASTE SIZE REDUCTION FACILITY
A. Briesmeister, J. Harper, R. Reich, and J. L. Warren 1982 14 p refs Presented at US/UK Workshop on Design of Size Reduction and Sorting Fac., Alburquerque, N.Mex., 11 May 1982
(Contract W-7405-eng-36)
(DE82-015772; LA-UR-82-1283; CONF-820562-1) Avail: NTIS HC A02/MF A01

To facilitate disposal of transuranic waste, Los Alamos National Laboratory designed and constructed the Size Reduction Facility (SRF) during the period 1977 to 1981. The engineering development, installation, and early test operations of the SRF are summarzied. The facility incorporates a large stainless steel enclosure fitted with remote handling and cutting equipment to obtain an estimated 4:1 volume reduction of gloveboxes and other bulky metallic wastes. DOE

N83-29027# Los Alamos Scientific Lab., N. Mex.
DESIGN OPTIONS FOR THE SP-100 THERMOELECTRIC NUCLEAR SPACE POWER PLANT
D. R. Koenig and W. A. Ranken 1982 7 p refs Presented at 17th Intersoc. Energy Conversion Engr. Conf., Los Angeles, 8 Aug. 1982
(Contract W-7405-eng-36)
(DE82-015813; LA-UR-82-1360; CONF-820814-9) Avail: NTIS HC A02/MF A01

Design options for the SP-100 Space Nuclear Power Plant (formerly SPAR) are reviewed that led to the current, radiatively coupled, baseline system design described in this paper. The selection of the radiative coupled configuration provides features that facilitate assembly, improves reliability and reduces the interactions between the nuclear and converter subsystem designs. Also the core design has continued to evolve incorporating individual fuel modules in the design. DOE

N83-29028# Brookhaven National Lab., Upton, N. Y.
NEUTRAL-BEAM SYSTEM BASED ON BNL NEGATIVE-HYDROGEN-ION SOURCES
K. Prelec 1982 6 p refs Presented at the Symp. on Heating in Toroidal Plasmas, Grenoble, France, 22-27 Mar. 1982
(Contract DE-AC02-76CH-00016)
(DE82-012470; BNL-31069; CONF-820345-9) Avail: NTIS HC A02/MF A01

Parameters of the conceptual design of the BNL neutral beam system were determined as follows: beam energy, 200 keV;

negative ion current, 10 A; neutral beam power, 1 MW; pulse length, multisecond to steady state. The completed system study, supported by successful ion source operation at the required level, will serve to evaluate and compare different approaches in the design of a negative ion based system and, eventually, lead to the design and construction of an operational system. DOE

N83-29029# Argonne National Lab., Ill.
GeV ELECTRON MICROTRON DESIGN REPORT
H. E. Jackson May 1982 225 p refs
(Contract W-31-109-eng-38)
(DE82-017657; ANL-82-22) Avail: NTIS HC A110/MF A01

Rising interest in the nuclear physics community in a GeV CW electron accelerator reflects the growing importance of high resolution short-range nuclear physics to future advances in the field. Major current problems are reviewed and the details of prospective measurements which could be made with a GeV CW electron facility are discussed, together with their impact on an understanding of nuclear forces and the structure of nuclear matter. The microtron accelerator was chosen as the technology to generate the electron beams required for the research discussed because of the advantages of superior beam quality, low capital and operating cost and capability of furnishing beams of several energies and intensities simultaneously. A complete technical description of the conceptual design for a 2 GeV double-sided CW electron microtron is presented. The accelerator can furnish three beams with independently controlled energy and intensity. DOE

N83-29030# Brookhaven National Lab., Upton, N. Y.
ACCELERATION OF HEAVY IONS TO VERY HIGH ENERGIES
Mark Q. Barton 1982 18 p refs Presented at the Workshop on Quark Matter Formation and Heavy Ion Collisions, Bielefeld, West Germany, 10-14 May 1982
(Contract DE-AC02-76CH-00016)
(DE82-017298; BNL-31312; CONF-8205102-1) Avail: NTIS HC A02/MF A01

The current interest of physics in the collisions of heavy ions closes an interesting circle in the technology of accelerator building. The first cyclic accelerator, built by R. Wideroe, was a linear accelerator designed to accelerate potassium ions. Subsequent to Wideroe's achievement, much of the art of accelerator construction has been devoted to creating energetic beams of electrons and protons. Now we find ourselves returning to the heavy ions, and Wideroe's linear accelerator structure still plays an important role in many acceleration schemes. Fortunately, while the particle physics community has concentrated on the electron and proton machines, the nuclear physicists have kept alive the interest in heavy ions. Now a host of electrostatic machines, cyclotrons, and heavy ion linear accelerators provide beams of all species of ions at energies from about 100 MeV per nucleon for light isotopes to 10 MeV per nucleon for the heaviest isotopes in support of vigorous physics programs. DOE

N83-29031# California Univ., Berkeley. Lawrence Berkeley Lab. Nuclear Science Div.
THE TARGET NUCLEUS IN RELATIVISTIC NUCLEAR COLLISIONS
Hans H. Gutbrod, A. I. Warwick, and H. Wieman Mar. 1982 29 p refs Presented at the MARIA Heavy Ion Workshop, Banff, Alberta, 22-26 Feb. 1982 Prepared in cooperation with Gesellschaft fuer Schwerionenforschung, Darmstadt, West Germany
(Contracts W-7405-eng-48; DE-AC03-76SF-00098)
(DE82-014460; LBL-14059; CONF-820238-5) Avail: NTIS HC A03/MF A01

Both the fireball model and hydrodynamical model predict, in a central collision, a fast energy dissipation in the early diving stage of the projectile into the target nucleus. In the final state both models show total incident energy largely dispersed over the whole target nucleus. In a quantitative comparison with the data for the intranuclear cascade calculations, however, the 90 deg double differential cross section seems to be flatter than the calculated one. If the slope is reflecting the temperature in the system then the data are having apparently a higher temperature than the cascade would predict. A picture of the reaction mechanism where the light projectile (e.g., Ne) gets stopped very early in the large target nucleus (e.g., AU or U) forming a small fireball at approximately half the beam rapidity, which decays inside the target nucleus, heating it up and causing the whole system to expand is discussed. DOE

74 OPTICS

Includes light phenomena.

N83-29032* National Aeronautics and Space Administration. John F. Kennedy Space Center, Cocoa Beach, Fla.
FIBER OPTIC CROSSBAR SWITCH FOR AUTOMATICALLY PATCHING OPTICAL SIGNALS Patent
Charles H. Bell, inventor (to NASA) Issued 3 May 1983 7 p Filed 27 May 1980 Supersedes N81-12862 (19 - 03, p 0410)
(NASA-Case-KSC-11104-1; US-Patent-4,381,881; US-Patent-Appl-SN-153245; US-Patent-Class-350-96.16; US-Patent-Class-455-612) Avail: US Patent and Trademark Office CSCL 20F

A system for automatically optically switching fiber optic data signals between a plurality of input optical fibers and selective ones of a plurality of output fibers is described. The system includes optical detectors which are connected to each of the input fibers for converting the optic data signals appearing at the respective input fibers to an RF signal. A plurality of RF to optical signal converters are arranged in rows and columns. The output of each of the optical detectors are each applied to a respective row of optical signal converted for being converters back to an optical signal when the particular optical signal converter is selectively activated by a dc voltage.
Official Gazette of the U.S. Patent and Trademark Office

N83-29033 Arizona Univ., Tucson.
NONLINEAR OPTICAL INTERFEROMETERS Ph.D. Thesis
Miguel Arturo Cervantes-Montoya 1982 86 p
Avail: Univ. Microfilms Order No. DA8227345

An experimental study of a novel type of interferometry based on the generation of Second Harmonic (SH) light was conducted. Interferometers are described in which an interference pattern arises when two SH waves are superimposed. These waves come from doubling the fundamental frequency of a laser by means of non-linear crystals. Three interferometers are described that have different applications according to their sensitivity to detect waveform distortions. One interferometer has low sensitivity and is useful in the contouring of refractive objects that produce large wavefront distortions of the order of hundreds of visible wavelengths. The other two interferometers have high sensitivity and one of the them is capable of detecting wavefront distortions as small as 1/20 of wavelength. Dissert. Abstr.

N83-29034 Bayerische Akademie der Wissenschaften, Munich (West Germany). Deutsche Geodaetische Kommission.
DEVELOPMENT OF A LONG RANGE PRECISION RANGE FINDER AS A BASIS FOR A MULTIWAVE DEVICE Ph.D. Thesis - Technische Univ., Bonn [ENTWICKLUNG EINES WEITREICHENDEN PRAEZISIONSDISTANZMESSERS ALS GRUNDLAGE FUER EIN MEHRWELLENGERAET]
Michael Scherer 1982 109 p refs In GERMAN; ENGLISH summary
(Ser-C-272; ISBN-3-7696-9324-8; ISSN-0065-5325) Copyright. Avail: Issuing Activity

The prototype of a high precision electrooptical range finder for measuring distances up to 30 km is described. The measuring system consists of a mode stabilized HeNe-laser tube which emits light varying its type of polarization at 640 MHz. On its way to the detecting photodiode a small part of this light beam is linearly polarized while the main part is directed to a cube corner. The reflected light beam passes through a rotating linear polarizer

before it is mixed in the diode with the beam from the inner path. The amplitude of the resulting output voltage is a function of the angular position of the rotating filter and of the phase delay between the signals of the internal and external light path. The angular position of the rotating filter and the sinuosidal output voltage of the diode are continuously correlated using phase locked loop technics. Results better than + or - (0.2 ppm) are achieved. Author (ESA)

N83-29035 Royal Signals and Radar Establishment, Malvern (England).
RUMFORD AND THE TEAPOTS: DEMONSTRATION OF THE FORMATION OF THERMAL IMAGES
E. H. Putley and D. E. Burgess Jan. 1983 15 p refs Original contains color illustrations
(RSRE-MEMO-3528; BR87380) Copyright. Avail: Issuing Activity

A modern version of a surface characteristics dependent radiation experiment originally performed by Count Rumford is described. The images obtained with a pyroelectric vidicon thermal imager are compared with the visible images to demonstrate the effects of the surface characteristics of the objects in the scene. Demonstrations of transmission and reflection effects using a modified Leslie cube are also included. The shown differences between visual and thermal images are important to the interpretation of thermal imager scenes. Author (ESA)

N83-29036# Hughes Research Labs., Malibu, Calif.
FIBER OPTIC MULTIMODE DEVELOPMENT STUDY Final Technical Report, Jul. 1980 - Jul. 1981
G. L. Tangonan and H. W. Yen Hanscom AFB, Mass. RADC Dec. 1982 71 p refs
(Contract F19628-80-C-0163; AF Proj. 2306)
(AD-A125389; RADC-TR-82-315) Avail: NTIS HC A04/MF A01 CSCL 20/6

A planar technology has been developed for fabrication of passive couplers for use in multimode fiber optics systems. Based on a previous study (F19628-78-C-0202), the masked ion exchange has been used for guide pattern formation. In this effort an optimization of the diffusion process has been attempted to maximize the fiber-to-channel coupling. Author (GRA)

N83-29037# Interactive Systems Corp., Littleton, Colo.
AUTOMATED ANALYSIS OF IMAGERY Final Report, 1 Apr. - 1 Oct. 1982
Dean Lucas and Laurie Gibson Nov. 1982 76 p refs
(Contract F49620-82-C-0070)
(AD-A125710; AFOSR-83-0055TR) Avail: NTIS HC A05/MF A01 CSCL 20/6

The objective of this research was to study possible techniques for extracting features and textural regions from imagery using Generalized Balanced Ternary. In addition, various aggregate measures were defined and their properties investigated as to their applicability in representing features. A mathematical definition of texture was derived based on the variance of the picture function over areas. This definition was tested on sample textures. Among the aggregate measures that were derived and studied was a function, f squared, which distinguishes shapes. The f squared is invariant under size, rotation, translation, and scaling in any axis. This measure and others were used in software which converted images in pixel form to higher level representations. Author (GRA)

N83-29038# Pattern Analysis and Recognition Corp., New Hartford, N.Y.
AUTOMATIC FEATURE EXTRACTION SYSTEM Final Technical Report, 2 Feb. 1978 - 31 May 1982
James L. Cambier Dec. 1982 174 p
(Contract F30602-78-C-0080; AF Proj. 3205)
(AD-A125645; PAR-82-19; RADC-TR-82-200) Avail: NTIS HC A08/MF A01 CSCL 20/6

The AFES (Automatic Feature Extraction System) is designed to be a testbed for evaluation of semi-automatic and computer-assisted techniques for automated production flow processes. Its intended input sources included National Sensors and LANDSAT imagery, and its functional capabilities are expandable to permit its use as an experimental testbed for feature extraction. Initial AFES capabilities are applicable to the extraction of planimetric, cultural, and landscape characteristics as required for production of Digital Feature Analysis Data (DFAD). The system's hardware configuration provides for input scanning and conversion, image storage and retrieval, interaction with multiple softcopy displays, feature delineation, and output plotting of feature data. The AFES software includes a large collection of system and applications modules which support a wide variety of functions. The operating system supports a multi-user environment, a tree-structure, a complete software control system for system and applications programs, program development aids, documentation aids, and interfaces to all peripheral devices and subsystems. GRA

N83-29039# California Univ., Livermore. Lawrence Livermore Lab.
METHOD FOR THE CONSTRUCTION OF PRECISION LINEAR ARRAYS OF OPTICAL FIBERS
R. Reedy Apr. 1982 13 p
(Contract W-7405-eng-48)
(DE82-012712; UCID-19337) Avail: NTIS HC A02/MF A01

A method is described for constructing precision linear arrays of optical fibers. The method provides for retaining both the buffered and bare portions of the fiber in a compact ruggedized unit with optical finishing on the fiber-end faces. The necessary fixturing, components, and techniques are described and illustrated. DOE

N83-29040# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany). Abt. Lasertechnik.
DEVICE FOR BEAM TRACKING WITH A QUADRANTENDETECTOR
Friedrich Malota Apr. 1982 28 p ref In GERMAN; ENGLISH summary
(DFVLR-Mitt-82-11) Avail: NTIS HC A03/MF A01; DFVLR, Cologne DM 11,60

A device which can hold a laser beam on a point or, in the case of moving objects, track a laser beam, is described. The device comprises a mirror with cardanic suspension and driven with piezoelectric crystals and a quadrant detector. The mirror is the limiting component with respect to the frequency to be reached. Laboratory and field test results are discussed. Author (ESA)

75 PLASMA PHYSICS

Includes magnetohydrodynamics and plasma fusion.

For ionospheric plasmas see *46 Geophysics*. For space plasmas see *90 Astrophysics*.

N83-29041 Michigan Univ., Ann Arbor.
TRANSIENT SELF FOCUSING OF LASER PULSES IN A COLD DENSE PLASMA Ph.D. Thesis
Andrew James Schmitt 1982 123 p
Avail: Univ. Microfilms Order No. DA8225043

The moment theory of self focusing is extended to describe transient self focusing of laser pulses. The Gaussian constant shape approximation is used in the analysis of behavior, but the radial distortion of the pulse field was investigated a posteriori by separating the radial modes, and deriving their governing relations. These methods were applied to pulse propagation in cold dense plasma. The thermal self focusing mechanism was found to exhibit a nonlinear saturation behavior for far above threshold powers; the plasma beating severely reduced the strength of this process. Numerical analysis of the self focusing behavior predicted that it can account for experimentally observed results. As the power of the incident pulse increases, the fractional transmitted energy decreases due to the large diffraction losses. The self focusing calculation also predicts the formation of large amplitude ion acoustic waves in the propagation region, due to the movements

of the pulse foci. This may result in a filamentation of the pulse. The radial distortion analysis does predict pulse break up due to these waves, but did not satisfactorily account for the subsequent propagation. Dissert. Abstr.

N83-29042 California Univ., Santa Cruz.
PHYSICAL PROCESSES IN RELATIVISTIC PLASMAS Ph.D. Thesis
Roland Svensson 1981 118 p
Avail: Univ. Microfilms Order No. DA8226626

Exact analytical expressions are derived in the born approximation for the pair annihilation rate and spectral emissivity from isotropic, monoenergetic electrons and positrons of arbitrary energies. The annihilation rate and spectral emissivity for arbitrary particle distribution functions are given as double integrals. Asymptotic expressions are derived for the annihilation rate, the cooling rate, and the spectral emissivity at relativistic temperatures. The physical properties of a thermal plasma in the temperature range (theta (= kT/sq mc), where m is the electron mass) = 1/3 - 100 are studied assuming pair equilibrium and thermal balance. Pair and photon producing processes in a plasma with a Thomson scattering optical depth of order unity or less are included. The spectral emissivities and the cooling rates for bremsstrahlung and pair annihilation are discussed. The pair production rates and the pair annihilation rate as well as the opacities are calculated. The equilibrium ratio of the pair density to the proton density is given. Parameter space dependence, cooling rates, optical depths, stability and confinement of the pair equilibria are discussed. Dissert. Abstr.

N83-29043 California Univ., Davis.
TIME RESOLVED SOFT X-RAY STUDIES OF ENERGY TRANSPORT IN LAYERED AND PLANAR LASER-DRIVEN TARGETS Ph.D. Thesis
Gary Stradling 1982 171 p
Avail: Univ. Microfilms Order No. DA8227895

New low energy X-ray diagnostic techniques are used to explore energy transport processes in laser heated plasmas. Streak cameras are used for the first time to provide 15 psec time resolution measurements of sub keV X-ray emission. A very thin carbon substrate provides a low energy X-ray window to the transmission photocathode of this soft X-ray streak camera. Active differential vacuum pumping of the instrument is required. X-ray spectral resolution, in the region below 1 keV which includes the spectral peak, is obtained through this initial use of the high energy cutoff properties of X-ray reflectors with X-ray streak cameras. In this application absorption edge filters provide spectral channel definition. Enhanced spectral resolution in five sub keV spectral bands, 10 eV wide, are made possible through the use of state of the art metal multilayer X-ray interference mirrors. These large d-spacing Bragg reflectors provide great flexibility in sub keV photon energy band selection and detector geometry. Dissert. Abstr.

N83-29044 Cornell Univ., Ithaca, N. Y.
NUMERICAL SIMULATION OF ION RINGS AND ION BEAM PROPAGATION Ph.D. Thesis
Alan Manofsky 1982 302 p
Avail: Univ. Microfilms Order No. DA8228452

The development of numerical simulation techniques for studying the physics of ion beams and rings in a background plasma as applicable to certain problems in magnetic and inertial confinement fusion is presented. Two codes were developed for these purposes: RINGA and CIDER. The 2 and 1/2 dimensional particle code RINGA follows the trajectories of ions in their self consistent magnetic field. The code assumes strict charge neutrality and admits currents only in the azimuthal direction. The injection and resistive trapping of ion rings was with RINGA. Modifications to RINGA to include finite pressure of confined plasma and beam ion electron slowing down collisions are discussed. In the CIDER hybrid code, ions are represented by particles and electrons by an inertialess thermal fluid which obeys a generalized Ohm's law. Fields are solved in the quasineutral Darwin approximation. Several collisional and atomic processes are included. Dissert. Abstr.

N83-29045# Institute of Plasma Physics, Prague (Czechoslovakia).
THE EVOLUTION OF PLASMA ELECTRONS DISTRIBUTION FUNCTION AT SOLITON GAS RELAXATION
P. Krocek Nov. 1982 24 p refs
(IPPCZ-246) Avail: NTIS HC A02/MF A01

The kinetic effect of the wide spectrum of Langmuir solitons, excited in a strong turbulent plasma, is described. It is shown, that soliton gas relaxation due to Landau damping of solitons, which precedes to collisional relaxation, leads to the formation of plateau on the electrons distribution function and ceasing of solitons Landau damping. The distribution function of solitons corresponds to the spectral energy density of turbulent noises founded in numerical simulation experiments. Author

N83-29046# Institute of Plasma Physics, Prague (Czechoslovakia).
CONVERGENCE OF L SUB P-NORMS OF LINEAR OPERATORS
P. Stavinoha Nov. 1982 11 p refs
(IPPCZ-240) Avail: NTIS HC A02/MF A01

A non-commutative extension of an assertion from the classical theory of integration is considered. Author

N83-29047# Institute of Plasma Physics, Prague (Czechoslovakia).
SHORT WAVELENGTH LOWER HYBRID WAVES NONLINEARLY EXCITED DUE TO PONDEROMOTIVE DENSITY MODULATIONS
R. Klima, I. M. Pankratov, P. Pavlo, and V. A. Petrzilka Nov. 1981 24 p refs
(IPPCZ-241) Avail: NTIS HC A02/MF A01

The propagation of finite amplitude lower hybrid waves at the plasma edge is analyzed. The plasma density modulations arising due to ponderomotive forces (approx. E(2)) lead in the first approximation to the generation of the third spatial harmonic waves. The gradients of plasma concentration and temperature are taken into account. The amplitude of the third spatial harmonics are found numerically. M.G.

N83-29048# Institute of Plasma Physics, Prague (Czechoslovakia).
SOME PHYSICAL PROBLEMS OF RF HEATED TOKAMAK PLASMA IN A HYBRID REACTOR REGIME
L. Krlin, P. Pavlo, and Z. Tluchor Feb. 1982 26 p refs
(IPPCZ-243) Avail: NTIS HC A03/MF A01

A simple physical model of RF heated Tokamak plasma and the first estimates of its parameters in a hybrid reactor regime are presented. The plasma is heated by the absorption of lower hybrid waves. Under conditions close to those of a hybrid reactor, estimates were made of the outgoing power deposited by alpha particles, the RF power absorbed in a plasma (to balance the energy losses), the driven current coupled with the RF absorption, the neutron flux and the production rate of plutonium. The magnitude of the driven current seems to be sufficient to maintain the steady state regime. M.G.

N83-29049# Nagoya Univ. (Japan). Inst. of Plasma Physics.
COMPARISON OF LOWER HYBRID ION HEATING IN TOKAMAK AND STELLARATOR PLASMAS IN JIPP T-2
K. Ohkubo, K. Kawahata, Y. Kawasumi, K. Matsuoka, N. Noda, K. Sakurai, S. Tanahashi, K. Matsuura, and J. Fujita Apr. 1983 41 p refs
(IPPJ-629) Avail: NTIS HC A03/MF A01

Experimental studies of lower hybrid ion heating in the Tokamak and stellarator plasmas were carried out in the JIPP T-2 torus. In both operations of the Tokamak and the stallarator, ion heating efficiency of bar n (e) delta T (i)/p (net) = 1.2 x 10 to the 13th power eV x 1/kW/cu cm is observed at a power level of 160 kW to 180 kW. The ion absorption efficiency of RF power in the stallarator is two thirds as large as that in the Tokamak. It is confirmed that the perpendicular energetic ion tails are produced near the plasma center and suffered from the pitch angle scattering

to the parallel direction, and at the same time, energetic ions escape out of the plasma due to delta B drift. Author

N83-29050# Nagoya Univ. (Japan). Inst. of Plasma Physics.
SOFT X-RAY IMAGING STUDY ON DISRUPTIONS IN THE JIPP T-2 TOKAMAK
Shunji Tsuji Apr. 1983 190 p refs
(IPPJ-630) Avail: NTIS HC A09/MF A01

An imaging system with 29 channels for viewing the plasma cross section and 3 channels for identifying poloidal and toroidal mode numbers, m and n, respectively was to investigate external disruptions. A high performance digital data acquisition system was developed for data processing. A weak m=1/n=1 mode that is locked with an m=2/n=1 mode is observed preceding an external disruption. Once the disruption occurs, the m=2/n=1 mode is converted into a strong m=1/n=1 mode. The internal thermal energy is swept out accompanied by vertically asymmetric collapse of soft X-ray profile due to the m=1/n=1 mode. A localized flas on the laminar is always observed due to a major disruption (a hard external disruption). These phenomena can be explained by the theory of asymmetric reconnections due to the interaction of the m=2/n=1 and m=1/n=1 modes. A.R.H.

N83-29051# KMS Industries, Ann Arbor, Mich.
MULTIFRAME HOLOGRAPHIC SHADOWGRAPHY AND INTERFEROMETRY OF LASER-TARGET PLASMAS
Garland E. Busch and George Charatis 21 Jun. 1982 18 p refs Presented at the 15th Intern. Congr. on High Speed Photography and Photonics, San Diego, Calif., 21 Aug. 1982
(Contract DE-AC08-82DP-40152)
(DE82-017186; KMSF-U-1247; CONF-820824-8) Avail: NTIS HC A02/MF A01

For purposes of characterizing and studying the formation and evolution of laser driven plasmas in fusion research, a method was developed to optically probe the plasmas and produce a sequence of four or more holographic time resolved image frames at equivalent rates to 20 billion/sec. The plasma UV probe operates at 0.26 micro m either in a shadowgraphic or interferometric mode. Electron density contours between approximately 10 to the 19th power and 10 to the 21st power cu cm are obtained from the interferograms. DOE

N83-29052# Naval Research Lab., Washington, D. C.
SPECTRAL DIAGNOSIS OF PLASMAS WITH 2-DIMENSIONAL NON-UNIFORMITIES
D. Duston and J. Davis 18 Mar. 1983 38 p
(AD-A125755; NRL-MR-5038) Avail: NTIS HC A03/MF A01 CSCL 07/4

A series of investigations concerning new techniques in X-ray spectroscopy of dense plasmas is reported on. Included are two improvements in the ionization-radiation model used to diagnose experimental spectral data from dense laboratory plasma: (1) a detailed model for dielectronic satellite line emission in dense plasmas; (2) an intergration scheme for the time-dependent atomic rate equations used to characterize collisional-radiative plasmas at highly non-equilibrium conditions. The model is then used to study 2-dimensional radiation phenomena in laser-heated plasmas. First, we investigate the effects of neglecting axial photon transport in the plasma blowoff on tracer-dot spectroscopy and subsequent temperature and density determinations. We find that the measured density may be as much as a factor of 2 in error when these effects are neglected, but measured temperatures are fortuitously correct to about 10%. Second, laternal inhomgenieties in plasma parameters are studied as they affect the K-shell X-ray spectrum emitted between the critical and ablation surface. A method is proposed to detect these non-uniformities via the techniques of tracer-dot spectroscopy. Author (GRA)

N83-29053# California Univ., Livermore. Lawrence Livermore Lab.
RECENT US TARGET-PHYSICS-RELATED RESEARCH IN HEAVY-ION INERTIAL FUSION: SIMULATIONS FOR TAMPED TARGETS AND FOR DISK EXPERIMENTS IN ACCELERATOR TEST FACILITIES
James W.-K. Mark 24 Jun. 1982 31 p refs Presented at the GSI Symp. on Accelerator Aspects of Heavy-Ion Fusion, Darmstadt, West Germany, 29 Mar. 1982
(Contract W-7405-eng-48)
(DE82-019116; UCRL-87378-Pt-2-Rev-1;
CONF-820338-3-Pt-2-Rev-1) Avail: NTIS HC A03/MF A01

One dimensional simulations indicate higher target gains with a judicious amount of tamping. However, for targets with outer tampers, a full investigation has not been carried through in regards to conservative criteria for fluid instabilities as well as reasonable imperfections in target fabrication and illumination symmetry, which all affect target ignition and burn. Comparisons of these results with the gain survey must be performed with care. These calculations suggest that experiments relating to high temperature disk heating, as well as beam deposition, focusing and transport can be performed within the context of current design proposals for accelerator test facilities. Since the test facilities have lower ion kinetic energy and beam pulse power as compared to reactor drivers, we achieve high beam intensities at the focal spot by using short focal distance and properly designed beam optics. DOE

N83-29054# California Univ., Livermore. Lawrence Livermore Lab.
RECENT US TARGET-PHYSICS-RELATED RESEARCH IN HEAVY-ION INERTIAL FUSION: TARGET GAINS AND RELATION TO ACCELERATOR DESIGN
James W.-K. Mark 24 Jun. 1982 44 p refs Presented at the GSI Symp. on Accelerator Aspects of Heavy-Ion Fusion, Darmstadt, West Germany, 29 Mar. 1982
(Contract W-7405-eng-48)
(DE82-019311; UCRL-97378-Pt-1-Rev-1;
CONF-820338-3-Pt-1-Rev-1) Avail: NTIS HC A03/MF A01

Inertial-fusion targets were designed for use with heavy ion accelerators as drivers in fusion energy power plants. In the interest of providing inputs for understanding the trade offs among accelerator designs, an initial survey was carried out regarding target gain versus parameter of relevance. This was done in two stages, firstly target gain was related to the beam energy, power, focal radius, and ion range. Target gain constraints on the beam occupied phase space volume of the linacs were posed. Some rather simplified models of accelerator final focus and beam transport in near vacuum fusion reaction chambers are discussed. Further analyses of the basic assumptions of this survey are also described. DOE

N83-29055# California Univ., Livermore. Lawrence Livermore Lab.
NONLOCAL BOLTZMANN THEORY OF PLASMA CHANNELS
Simon S. Yu and Ralph E. Melendez 3 Jan. 1983 24 p refs
(Contract W-7405-eng-48)
(DE83-008310; UCID-19731) Avail: NTIS HC A02/MF A01

The mathematical framework for the Lawrence Livermore National Lab. (LLNL) code NUTS is developed. This code is designed to study the evolution of an electron beam generated plasma channel at all pressures. The Boltzmann treatment of the secondary electrons presented include all inertial, nonlocal, electric and magnetic effects, as well as effects of atomic collisions. Field equations are advanced simultaneously and self-consistently with the evolving plasma currents. DOE

N83-29056# Stanford Univ., Calif. Lab. for High Temperature Gasdynamics.
COMBUSTION MHD EXPERIMENTS AT 5 TESLA Ph.D. Thesis
Bradford C. Bennett Apr. 1982 171 p refs
(Contracts DE-AC01-80ET-15611; EX-76-C-01-2341)
(DE82-017156; DOE/ET-15611/T4; HTGL-202) Avail: NTIS HC A08/MF A01

An experimental linear MHD channel was designed, developed, and operated at high magnetic fields with a seeded combustion plasma. The channel's performance was investigated analytically with a one-dimensional model which included axial current leakage.

Two-dimensional calculations were performed to examine model predictions and channel performance. The goal was to collect early data on MHD channel performance at high magnetic fields to guide future work in this area. DOE

N83-29057# Oak Ridge National Lab., Tenn. Engineering Physics Div.

SENSITIVITY ANALYSIS FOR A SPECIFIC FUSION REACTOR SHIELDING EXPERIMENT CONTAINING TUNGSTEN

R. G. Alsmiller, Jr., R. T. Santoro, R. L. Childs, J. M. Barnes, and J. L. Lucius Jun. 1982 25 p refs Submitted for publication
(Contract W-7405-eng-26)
(DE82-016370; ORNL/TM-8105) Avail: NTIS HC A02/MF A01

The results of a cross section sensitivity analysis are presented. Only the nuclear cross section data for the elements in Hevimet were considered. The cross section sensitivities are found to be quite small and it is concluded that it is unlikely that the disagreement is due to errors in the cross section data used for the elements in Hevimet. DOE

N83-29058# Sandia Labs., Albuquerque, N. Mex.

LIFETIME ANALYSIS OF FUSION-REACTOR FIRST-WALL COMPONENTS

R. D. Watson, R. R. Peterson (Wisconsin Univ., Madison), and W. G. Wolfer (Wisconsin, Univ., Madison) 1982 14 p refs Presented at the ASME Pressure Vessel and Piping Conf., Orlando, Fla., 27 Jun. 1982
(Contract DE-AC04-76DP-00789)
(DE82-016665; SAND-82-1203C; CONF-820601-11) Avail: NTIS HC A02/MF A01

Linear elastic fracture mechanics are used to predict the growth of a semielliptical surface flaw through a thin-walled actively cooled 316 stainless steel first wall in a Tokamak power reactor, which is subjected to pulsed surface heat fluxes, 14 MeV neutron irradiation and sputtering from particle bombardment. The results, from an inelastic stress analysis, which includes thermal creep, irradiation creep, swelling, and wall thinning, are coupled to the crack growth calculations. The effects of temperature, R-ratio, threshold K, neutron induced embrittlement, creep crack growth and two-dimensional flaw shape changes are included. Predictions for a cylindrical blanket module with hemispherical first wall end cap indicate that severe reductions in lifetime can occur when radiation damage effects are included and demonstrate the need for high fluence data on da/dN and K/sub Ic/. DOE

N83-29059# California Univ., Livermore. Lawrence Livermore Lab.

REVIEW OF UPCONVERTED Nd-GLASS LASER PLASMA EXPERIMENTS AT THE LAWRENCE LIVERMORE NATIONAL LABORATORY

K. R. Manes May 1982 39 p refs Presented at the Ultraviolet Spectroscopy Meeting, Boulder, Colo., 8-10 Mar. 1982 Submitted for publication
(Contract W-7405-eng-48)
(DE82-015167; UCRL-86956; CONF-820336-8) Avail: NTIS HC A03/MF A01

During 1980 and 1981 the Livermore program undertook to measure the laser light absorption of high and low Z plasmas and the partition of the absorbed energy amongst the thermal and suprathermal electron populations as a function of both laser intensity and wavelength. Simulations suggested that short wavelength laser light would couple more efficiently than longer wavelengths to target plasmas. Shorter wavelength heating of higher electron plasma densities would, it was felt, lead to laser-plasma interactions freer of anomalous absorption processes. DOE

N83-29060# California Univ., Livermore. Lawrence Livermore Lab.

SOURCES OF HOT ELECTRONS IN LASER-PLASMA INTERACTION WITH EMPHASIS ON RAMAN AND TURBULENCE ABSORPTION

Kent Estabrook, W. L. Kruer, D. W. Phillion, R. E. Turner, and E. M. Campbell 6 Apr. 1982 9 p refs Presented at the Japan-US Seminar on Theory and Appl. of Multiply-Ionized Plasmas Produced by Laser and Particle Beams, Nara, Japan, 3-7 May 1982 Submitted for publication
(Contract W-7405-eng-48)
(DE82-012787; UCRL-87496; CONF-820528-3) Avail: NTIS HC A02/MF A01

Heating targets with high power lasers results in a sizable fraction of the absorbed energy going into electrons of temperature much greater than thermal which can pre-heat the pellet core and accelerate fast ion blowoff which results in poor momentum transfer and hence poor compression efficiency. The present emphasis is to build lasers of higher frequency, which at the same W/sq cm results in more absorption into cooler electrons. Two physical reasons are that the laser can propagate to a higher electron density, n, resulting in more collisional inverse bremsstrahlung absorption proportional to n, and because the hot temperatures from some plasma absorption processes increase as the oscillatory velocity of an electron. The heated electron temperatures from other plasma processes helps by increasing the competing collisional absorption and decreasing the Raman gain. DOE

N83-29061# Stanford Univ., Calif.

HIGH-MAGNETIC-FIELD MHD-GENERATOR PROGRAM Quarterly Report, 1 Jan. 1982 - 30 Mar. 1982

C. H. Kruger, R. H. Eustis, M. Mitchner, S. A. Self, J. K. Koester, and T. Nakamura Apr. 1982 24 p refs
(Contract DE-AC01-80ET-15611)
(DE82-015447; DOE/ET-15611/9) Avail: NTIS HC A02/MF A01

Progress in an experimental and theoretical program designed to investigate a number of important problems in the development of MHD generator channels is summarized. The areas of research include nonuniformity and stability effects, boundary layers, Hall field breakdown, the effects of electrode configuration and current concentrations, and studies of steady-state combustion disk and linear channels in a 6-Tesla magnet of small dimensions. DOE

N83-29062# MPB Technologies, Inc., Sainte-Anne-de-Bellevue (Quebec).

TRANSPORT EFFECTS WITH HOT ELECTRONS IN LASER FUSION Final Report, 1 Oct. 1981 - 28 Feb. 1983

I. P. Shkarofsky Feb. 1983 110 p refs
(Contract DE-AC08-81DP-40162)
(DE83-009311; DOE/DP-40162/1) Avail: NTIS HC A06/MF A01

Two explanations are offered which can account for heat inhibition found in laser-fusion experiments. The first explanation requires an anisotropic electron velocity distribution with a higher temperature parallel to the surface than into the surface. This provides axial heat inhibition. Lateral heat inhibition is associated with azimuthal magnetic fields. The second explanation requires the presence of both hot suprathermal and thermal electrons. The hot electrons can cause the flux limiter to decrease substantially below the free-streaming limit in an intermediate range of collisionality. Conditions for this situation occur in the coronal region. We compare a Maxwellian distribution to an exp(-v(5)/v(5)/sub c/) variation for the cold electrons and find that the flux limiter decreases more for the latter case. The effects of collisions between cold and hot electrons is also looked into. The Cartesian tensor approach is used in the above investigations with various forms for the zeroth order electron velocity distribution function. DOE

N83-29063# Burns and Roe, Inc., Woodbury, N. Y.

UTILITY REQUIREMENTS FOR FUSION

R. J. Vondrasek Feb. 1982 141 p Sponsored by EPRI
(EPRI Proj. 1413-1)
(DE82-903118; EPRI-AP-2254) Avail: NTIS HC A07/MF A01

Work done and results obtained during performance of Task 1 of a study of Utility Requirements and Criteria for Fusion Options are described. The work consisted of developing a list of utility requirements for fusion optics containing definition of the requirements and showing their relative importance to the utility industry.

The project team members developed a preliminary list which was refined by discussions and literature searches. The refined list was recast as a questionnaire which was sent to a substantial portion of the utility industry in this country. Forty-three questionnaire recipients responded including thirty-two utilities. A workshop was held to develop a revised requirements list using the survey responses as a major input. The list prepared by the workshop was further refined by a panel consisting of vice presidents of the three project team firms. The results of the study indicate that in addition to considering the cost of energy for a power plant, utilities consider twenty-three other requirements. Four of the requirements were judged to be vital to plant acceptability: Plant Capital Cost, Financial Liability, Plant Safety and Licensability. DOE

N83-29064# Georgia Inst. of Tech., Atlanta.
AN ANALYSIS OF THE PLASMA IMPURITY INFLUX FROM ALKALI-METAL COATINGS FOR FUSION-REACTOR APPLICATIONS
A. B. DeWald, J. N. Davidson, A. R. Krauss, and D. M. Gruen 1982 21 p refs Presented at the 5th Intern. Conf. on Plasma Surface Interactions in Controlled Fusion Devices, Gatlinburg, Tenn., 3-7 May 1982
(Contract DE-AS05-78ET-52025)
(DE82-016659; GTFR-35; CONF-820545-17) Avail: NTIS HC A02/MF A01

Recently, it has been proposed that alkali-metal covered surfaces be applied to magnetic fusion devices as a means of controlling plasma impurity contamination and shielding the substrate from erosion. Monolayer films of alkali metals have been shown to sputter primarily as ions under particle bombardment. Thus, it is thought that a sheath potential and/or magnetic fields encountered by a sputtered ion will return the ion to the surface without entering the plasma. Included in the analysis are sputtered substrate atoms. These are sometimes found to be a significant fraction of the total sputtering yield for low-Z alkali monolayers and affect the overall performance of such coatings. Estimates of the impurity influx made in the neighborhood of a sheath potential show that secondary-ion emitting coatings are effective as a means of inhibiting plasma impurity contamination and wall erosion. DOE

N83-29065# California Univ., Livermore. Lawrence Livermore Lab.
TIME-RESOLVED SOFT-X-RAY STUDIES OF ENERGY TRANSPORT IN LAYERED AND PLANAR LASER-DRIVEN TARGETS Ph.D. Thesis - California Univ., Davis
Gary Lane Stradling 19 Apr. 1982 174 p refs
(Contract W-7405-eng-48)
(DE82-017289; UCRL-53271) Avail: NTIS HC A08/MF A01

New low-energy X-ray diagnostic techniques are used to explore energy-transport process in laser heated plasmas. Streak cameras are used to provide 15-psec time-resolution measurements of sub keV X-ray emission. A very thin carbon substrate provides a low-energy X-ray transparent window to the transmission photocathode of this soft X-ray streak camera. Active differential vacuum pumping of the instrument is required. The use of high-sensitivity, low secondary electron energy spread CsI photocathodes in X-ray stream cameras is also described. Significant increases in sensitivity with only a small and intermittant decrease in dynamic range were observed. These coherent, complementary advances in sub keV, time-resolved X-ray diagnostic capability are applied to energy-transport investigations of 1.06 micron laser plasmas. Both solid disk targets of a variety of Z's as well as Be-on-Al layered-disk targets were irradiated with 700-psec laser pulses of selected intensity. DOE

N83-29066# Los Alamos Scientific Lab., N. Mex.
HIGH-FLUX FIRST-WALL DESIGN FOR A SMALL REVERSED-FIELD PINCH REACTOR
G. E. Cort, A. L. Graham, and K. E. Christensen 1982 11 p refs Presented at the IEEE Intern. Conf. on Plasma Sci., Ottawa Canada, 17 May 1982 Presented at the AIAA/ASME Fluid, Plasma, Thermophys., and Heat Transfer Conf., St. Louis, 8-11 Jun. 1982
(Contract W-7405-eng-36)
(DE82-010426; LA-UR-82-220; CONF-820517-1; CONF-820634-1) Avail: NTIS HC A02/MF A01

To achieve the goal of a commercially economical fusion power reactor, small physical size and high power density should be combined with simplicity (minimized use of high technology systems). The Reversed-Field Pinch (RFP) is a magnetic confinement device that promises to meet these requirements with power densities comparable to those in existing fission power plants. To establish feasibility of such an RFP reactor, a practical design for a first wall capable of withstanding high levels of cyclic neutron wall loadings is needed. Associated with the neutron flux in the proposed RFP reactor is a time averaged heat flux of 4.5 MW/sq m with a conservatively estimated transient peak approximately twice the average value. The design for a modular first wall made from a high-strength copper alloy that will meet these requirements of cyclic thermal loading is presented. The heat removal from the wall is by subcooled water flowing in straight tubes at high linear velocities. DOE

N83-29067# Los Alamos Scientific Lab., N. Mex.
STATISTICAL THEORY OF FIELD FLUCTUATIONS IN A REVERSED-FIELD PINCH
Leaf Turner 1982 5 p refs Presented at the Intern. Conf. on Plasma Phys., Goteborg, 9-15 Jun. 1982
(Contract W-7405-eng-36)
(DE82-008114; LA-UR-82-418; CONF-820618-2) Avail: NTIS HC A02/MF A01

A statistical description of three-dimensional, incompressible turbulence in an ideal, current-bearing, bounded magnetofluid is given both analytically and numerically. The results are then compared with existing data taken from reversed-field pinch experiments. DOE

N83-29068# Brookhaven National Lab., Upton, N. Y.
PROGRESS IN THE DEVELOPMENT OF STEADY NEGATIVE ION SOURCES FOR FUSION APPLICATIONS
K. Prelec 1982 15 p refs Presented at the 11th Yugoslav Summer School and Intern. Symp. on the Phys. of Ionized Gases, Dubrovnik, Yugoslavia, 23-27 Aug. 1982
(DE82-014701; BNL-31508; CONF-820830-1) Avail: NTIS HC A02/MF A01

The development of steady state sources of negative hydrogen or deuterium ions has made substantial progress. There are several approaches under investigation, some operating with long pulses and some in a true steady state, and delivering H(-) or D(-) beam currents of several hundred mA up to 1 A. The improvement in the gas efficiency from a few percent for pulsed sources to the range of 5% to 15% and possibly even higher for the new sources, is another advance. A higher gas efficiency has come as the result of using independent plasma generation and geometrical focusing of surface produced negative ions. The power efficiency has not been changed so much, but, in a high energy system, savings of a few kW/A are less important than the reduction of the gas load. It can be expected that a small (< 1 MW) long pulse or steady state neutral beam system based on negative ions could be put into operation. DOE

N83-29069# Massachusetts Inst. of Tech., Cambridge. Plasma Fusion Center.
TECHNICAL RESEARCH PROGRAMS
Feb. 1982 119 p
(Contract DE-AC02-78ET-51013)
(DE82-013533; DOE/ET-51013/33) Avail: NTIS HC A06/MF A01

Research programs have produced significant results on four fronts: (1) the basic physics of high-temperature fusion plasmas (plasma theory, RF heating, development of advanced diagnostics and small-scale experiments on the Versator Tokamak and Constance mirror devices); (2) major confinement results on the Alcator A and C Tokamaks, including pioneering investigations of the equilibrium, stability, transport and radiation properties of fusion plasmas at high densities, temperatures and magnetic fields; (3) development of a new and innovative design for axisymmetric

tandem mirrors with inboard thermal barriers, with initial operation of the TARA tandem mirror experimental facility scheduled for 1983; and (4) a broadly based program of fusion technology and engineering development that addresses problems in several critical subsystem areas (e.g., magnet systems, superconducting materials development, environmental and safety studies, advanced gyrotron development for RF heating, preconceptual design studies of torsatrons and stellarators, and advanced Tokamak design and reactor studies). DOE

N83-29070# Massachusetts Inst. of Tech., Cambridge. Plasma Fusion Center.
LONG-PULSE IGNITED TEST EXPERIMENT (LITE): AN ALTERNATE FOR TFTR UPGRADE
L. Bromberg, D. R. Cohn, J. E. C. Williams, and D. L. Jassby (Princeton Univ.) Jun. 1982 13 p refs
(Contract DE-AC02-78ET-51013)
(DE82-018315; DOE/ET-51013/48; PFC/RR-8218) Avail: NTIS HC A02/MF A01

By using high performance resistive magnets it is possible to design a relatively compact Tokamak which could achieve ignition, provide long pulse operation with Q sub p > 5 and advance fusion engineering. This device could be built at the TFTR site at relatively moderate cost. Illustrative features for this type of device, referred to as LITE for long-pulse ignited test experiment, are described. Forced flow liquid nitrogen cooling at constant temperature is used to minimize the TF magnet power requirements. Illustrative parameters are a major radius of 2.7 m, a maximum magnetic field on axis of 8.8 T, and an average beta of 0.044. DOE

N83-29071# Illinois Univ., Urbana. Fusion Studies Lab.
FIRST-WALL SPUTTERING EFFECTS IN CAT-D TOKAMAKS
John Galambos, George Miley, and John Gilligan 1982 7 p refs Presented at the 5th Intern. Conf. on Plasma Surface, Gatlinburg, Tenn., 3-7 May 1982
(Contract DE-AC02-76ET-52040)
(DE82-016824; DOE/ET-52040/243; CONF-820545-12) Avail: NTIS HC A02/MF A01

Cat-D Tokamaks offer the important advantages of elimination of the need to breed tritium and less frequent first-wall replacement due to reduced neutron damage effects. To capitalize on these features, however, the erosion of the low-Z first-wall coating must be addressed. As shown here, this appears to be feasible if a highly efficient (beta' < 0.9) mechanical limiter system can be developed. Still, due to the many uncertainties involved, the simultaneous development of in situ techniques for redeposition coatings appears desirable. DOE

N83-29072# Princeton Univ., N. J. Lab. for Plasma Physics.
FIRST RESULTS FROM A SOFT X-RAY LASER EXPERIMENT IN A CONFINED PLASMA COLUMN
S. Suckewer, L. C. Johnson, K. Sato, A. Semet, C. H. Skinner, and D. Voorhees Apr. 1982 30 p refs
(Contract DE-AC02-76CH-03073)
(DE82-014960; PPPL-1896) Avail: NTIS HC A03/MF A01

A description of the experimental set up and the first results from an experiment designed to achieve lasing action in the soft X-ray region of the spectrum is presented. A 0.5 kJ CO2 laser was focused into a target gas, typically CO2, and the resulting plasma was confined in a 50 to 90 kG magnetic field. Spectroscopic diagnostics were used to monitor the n = 7 and n = 8 level populations of CVI as well as ultraviolet emission lines of CV and CIII, for different plasma conditions. Data show that as the confining magnetic field was increased, the plasma column diameter decreased, the CVI 3434 line intensity (7 yields 6 transition) increased and its decay time decreased consistent with earlier computer modeling. The effect of the low intensity tail, normally present in CO2 laser pulses, on the predicted population inversion is also discussed. Analysis of the experimental data by computer simulation shows the range of expected total gain on the n = 3 to n = 2 transition at 182A in these experiments was G = 0.05 to 0.1 and the possibility for its significant increase. DOE

N83-29073# Wisconsin Univ., Madison.
SHEAR ALFVEN RESONANCES IN TOKAPOLE 2
F. D. Witherspoon, S. c. Prager, and J. C. Sprott Mar. 1982 6 p refs Presented at the Symp. on Heating in Toroidal Plasmas, Grenoble, France, 22 Mar. 1982
(Contract DE-AS02-76ET-53051)
(DE82-013247; DOE/ET-53051/31; CONF-820345-6) Avail: NTIS HC A02/MF A01

Efficient heating can occur by coupling energy through the shear Alfven resonance that is predicted to occur at particular locations within inhomogeneous plasmas. This heating mechanism is applicable to Tokamaks; however, the existence of the resonances in Tokamaks was yet established experimentally. Direct observations of localized enhancement in the driven wave magnetic field which are compatible with theoretical predictions for the shear Alfven resonance in Tokamak geometry are presented. These resonance studies at low absorbed power are followed by higher power heating (approximately 1 MW) presently being developed. DOE

N83-29074# Los Alamos Scientific Lab., N. Mex.
MULTI-DIMENSIONAL HYBRID-SIMULATION TECHNIQUES IN PLASMA PHYSICS
D. W. Hewett 1982 4 p refs Presented at the 10th IMACS World Conf. on Systems Simulation and Sci. Computation, Montreal, 8-13 Aug. 1982
(Contract W-7405-eng-36)
(DE82-011975; LA-UR-82-575; CONF-820810-3) Avail: NTIS HC A02/MF A01

Multidimensional hybrid simulation models have been developed for use in studying plasma phenomena on extended time and distance scales. The models make fundamental use of the small Debye length or quasineutrality assumption. The ions are modeled by particle in cell (PIC) techniques while the electrons are considered a collision dominated fluid. The fields are calculated in the nonradiative Darwin limit. Some electron inertial effects are retained in the Finite Electron Miss model (FEM). In this model, the quasineutral counterpart of Poisson's equation is obtained by first summing the electron and ion momentum equations and then taking the quasineutral limit. In the Zero Electron Mass (ZEM) model explicit use is made of the axisymmetric properties of the model to decouple the components of the model equations. Equations to self consistently advance the electron temperature have recently been added to the scheme. The model equations which result from these considerations are two coupled, nonlinear, second order partial differential equations. DOE

N83-29075# Princeton Univ., N. J. Plasma Physics Lab.
ROLE OF ATOMIC COLLISIONS IN FUSION
D. E. Post Apr. 1982 63 p refs
(Contract DE-AC02-76CH-03073)
(DE82-014961; PPPL-1877) Avail: NTIS HC A04/MF A01

Atomic physics issues have played a large role in controlled fusion research. A general discussion of the present role of atomic processes in both magnetic and inertial controlled fusion work is presented. DOE

N83-29076# Auburn Univ., Ala. Dept. of Physics.
THEORY OF RF HEATING OF TOROIDAL PLASMAS
1982 75 p
(DE83-008267; DOE/ER-53134/1) Avail: NTIS HC A04/MF A01

Principal accomplishments include: the completion of graphic output with color-coded multiple rays; a more expensive parameter study; a large new section of coding for focusing effects; an analytic study of a simple integrable system to help understand the failure of the WKB method at mode conversion layers; exploration of techniques for doing ray-tracing in a numerically computed equilibrium; introduction of the effects of oblique incidence on a 4th-order mode conversion problem; derivation of a Green function for a 6th-order mode conversion problem; derivation of a new system of equations governing arbitrarily high-order mode conversion layer; a numerical technique for solving mode conversion problems; calculation of quasimode decay growth rates in the

LHTOR code; a demonstration that quasimode decay may be candidate to explain the observed lower-hybrid current drive high density cutoff; and installation of a remote user service station (RUSS) for the MFFCC network. DOE

76 SOLID-STATE PHYSICS

Includes superconductivity.

For related information, see also *33 Electronics and Electrical Engineering* and *36 Lasers and Masers.*

N83-29077 Northwestern Univ., Evanston, Ill.
THEORETICAL ELECTRONIC AND MAGNETIC STRUCTURE OF REDUCED SYMMETRY SYSTEMS Ph.D. Thesis
Michael Theodor Alfred Weinert 1982 161 p
Avail: Univ. Microfilms Order No. DA8226041

Reduced symmetry systems such as surfaces and molecules are of interest because of their intrinsic properties as well as for understanding trends with reduced translational symmetry. For these systems, the standard shape approximations to the potential used in electronic (band) structure calculations are suspect because of the low local symmetry. A method for solving Poisson's equation for a general periodic density based on the concept of multipole potentials and the Dirchlet problem for a sphere is presented. This method is implemented as the full-potential linearized augmented plane wave method, which is ideally suited for treating reduced symmetry systems. The two types of systems considered are the Si2 molecule and linear chains of the 3d transition metals Ni and Fe. Dissert. Abstr.

N83-29078 Illinois Univ., Chicago.
THEORY OF OPTICAL AND MAGNETIC PROPERTIES OF DEEP CENTERS IN SEMICONDUCTORS Ph.D. Thesis
Maria Helena deAzambuja Viccaro 1982 177 p
Avail: Univ. Microfilms Order No. DA8225159

The theory of optical and magnetic properties of deep centers in various III-V semiconductors is addressed. The localized impurity levels of GaAs:Cr2(+), GaAs:Cr3(+), InP:Fe2(+), GaAS:Fe2(+), and GaP:Fe2(+) materials are analyzed in the framework of a molecular cluster, taking into account the crystalline fields, Jahn-Teller distortion, and spin-oribt and spin-spin interactions. Cluster wave functions, compatible with tetrahedral and tetragonal symmetries, are constructed, using the best available self-consistent atomic wave functions for the impurity ion and the nearest-neighbors atoms. The multi-center integrals encountered in the calculations are evaluated using an available expression for the expansion of Slater orbitals from one center onto another. A generalized treatment for the electron-electron interactions of the impurity centers is presented, and the matrices for the d(2), d(3), d(4), and d(5) configurations are explicity listed for the irreducible representations of the cubic crystal field. The general matrices are used to calculate the energy splitings of GaAs:Cr3(+) and GaAs:Cr2(+). Dissert. Abstr.

N83-29079 Northwestern Univ., Evanston, Ill.
SHEAR MECHANICAL PROPERTIES OF LIQUID CRYSTAL FILMS Ph.D. Thesis
John Christopher Tarczon 1982 104 p
Avail: Univ. Microfilms Order No. DA8226029

The in-plane shear response of thin, freely-suspended films of a liquid crystal, butyloxygenzylidene octylaniline (BBOA or 40.8), driven at sub-audio frequencies (0.25-80 Hz), was studied at temperatures around the bulk smectic-A-smectic-B transition. A highly sensitive torsion pendulum was designed and constructed for this purpose. The amplitude and phase of the pendulum-film system were measured in response to an external driving force and, from these, the shear modulus and shear viscosity of the film were calculated. Data were collected as functions of temperature and shearing frequency on films of varying thickness. All films showed solid-like behavior well above the bulk A-B transition temperature, with the onset of solid-like behavior appearing at higher temperature in thinner films. The thickness dependence can be qualitatively explained by a model which assumes the surface layers are move highly ordered than the interior. Both the shear modulus and shear dessipation exhibited a strong frequency dependence in the A and B phases. Dissert. Abstr.

N83-29080 Texas A&M Univ., College Station.
SURFACE ELECTRONIC STATES IN SEMICONDUCTORS AND SURFACE PHONONS: A NEW APPROACH Ph.D. Thesis
Richard Paul Beres 1982 178 p
Avail: Univ. Microfilms Order No. DA8226063

The analytic Green's function, effective Hamiltonian technique is utilized in calculations of bound states and resonances at solid surfaces. The results for electronic states in compound semiconductors are found to be in excellent agreement with angle-resolved photoemission and other experimental measurements. The analytic representation of the crystal Green's function in a study of phonons at the (100) surface of a face-centered cubic crystal. It is found that there are two new types of singularities in the surface contribution to the density of states, which were termed zero-width antiresonances and extremal-point singularities. They arise from the singularities that are evident in the analytic representation of the crystal Green's function when some group velocity v sub 3 approaches zero. Next, calculation of bound and resonant surface states at the relaxed (110) surface of 11 compound semiconductors--GaAs, GaP, GaSb, ZnSe, ZnTe, InAs, InP, InSb, AiAs, AiSb, and AIP is addressed. The predicted dispersion curves (energy versus planar wavevector) for GaAs and ZnSe are in excellent agreement with previous experimental studies using angle-resolved photoemission (ARP) spectroscopy. Dissert. Abstr.

N83-29081 California Univ., Santa Barbara.
THE APPLICATION OF INELASTIC ELECTRON TUNNELING SPECTROSCOPY TO SURFACE CHEMISTRY AND CATALYSIS Ph.D. Thesis
Atiye Bayman 1982 83 p
Avail: Univ. Microfilms Order No. DA8224635

Inelastic electron tunneling spectroscopy is a sensitive vibrational technique that can study the adsorption of organic molecules on surfaces. Tunneling spectroscopy was applied to surface chemistry and catalysis, in particular to the chemisorption of diols and esters on alumina and acetylene on alumina supported palladium particles. Inelastic electron tunneling spectroscopic study of lubricant additives reveal that long chain 1,2 and 1,3 diols form stronger bonds to alumina than the corresponding alcohols or acids. Diols react with the alumina surface by losing both of the protons from the hydroxyl groups. Tunneling spectra of acetylene on palladium particles supported by alumina reveal weakly bonded acetylene two types of strongly bonded acetylene and two other rehybridized species. Heating to 130 C in H2 produces formate ions from some of these species. Tunneling spectra for esters of the form RCOOR' show that these compounds dissociate on alumina and only the RCOO-ion bonds to the surface.
Dissert. Abstr.

N83-29082 Pennsylvania Univ., Philadelphia.
SINGLE AND MULTIPHOTON EXCITATION OF SECONDARY LIGHT EMISSION BY THE NOBLE METALS Ph.D. Thesis
Daniel John Whittle 1982 171 p
Avail: Univ. Microfilms Order No. DA8227330

Theoretical and experimental investigation of electron hole pair processes in the noble metals as manifested through secondary light emission. Secondary light emission includes Raman scattering and luminescence processes in which the emitted (scattered) photons have frequencies different fom the incident photons. The secondary light emission processes include the (virtual or real) optical excitation and radiative recombination of electron hole pairs. The experiments performed include two photon processes (i.e., these that involve single photon excitation and single photon emission) and three or more photon processes (i.e., those that involve multiphoton excitation and single photon emission). Dissert. Abstr.

N83-29083 Pennsylvania Univ., Philadelphia.
OBSERVATION OF GAP INHOMOGENEITY IN SUPERCONDUCTING ALUMINUM TUNNEL JUNCTIONS Ph.D. Thesis
Harvey Raymond Gilmartin 1982 108 p
Avail: Univ. Microfilms Order No. DA8227272

Experiments using a technique to investigate spatial variations in the superconducting gap parameter of aluminum films driven out of equilibrium by intense tunnel injection are described. The technique features fine spatial and energy resolution of the gap parameter. The experiments employed a finely focused laser spot scanned across the surface of a double tunnel junction sandwich to produce a very weak electrical signal that was analyzed to determine the gap parameter as a function of position in the plane of the device. Technical aspects of the problem are emphasized, since a new technique is presented. An elaborate explanation of the origin and analysis of the laser induced signal is given, as well as a detailed description of the experimental apparatus.
Dissert. Abstr.

N83-29084 Virginia Univ., Charlottesville.
ELECTRON TUNNELING SPECTROSCOPY AND EFFECTS OF BARRIER PREPARATION Ph.D. Thesis
Robert Andrew Dragoset 1982 184 p
Avail: Univ. Microfilms Order No. DA8228623

Inelastic electron tunneling spectroscopy (ETS) is a sensitive technique used in determining the molecular vibrational structure of organic compounds in the barrier region of metal insulator metal tunnel junctions. In this study of Al-Al0 sub x M junctions, the effects of changes in the alumina barrier and the top metal electrode on the elastic and inelastic electron tunneling currents are examined. Modifications of the alumina barrier include cooling the substrate to -190 C before evaporation of the top metal electrode and roughening the alumina surface by depositing a thin film of CaF2 on the glass substrate before depositing the Al electrode. A decrease in the vibrational mode intensity of the dopant molecule in the IET spectra and a decrease in the asymmetry of the effective tunneling barrier calculated by a computer routine to fit the I versus V data are correlated to the increase in hydroxyl ion surface concentration. Dissert. Abstr.

N83-29085 Cornell Univ., New York.
X-RAY DIFFRACTION STUDY OF THE STRUCTURE OF GRAIN BOUNDARIES Ph.D. Thesis
John David Budai 1982 229 p
Avail: Univ. Microfilms Order No. DA8228388

How X-ray diffraction techniques can be used to study various aspects of the atomic structure of grain boundaries is demonstrated. The two major experimental techniques which have been developed in order to observe the weak X-ray scattering from a grain boundary are described. They are the construction and use of (1) a two-dimensional detector with a much higher efficiency than X-ray film, and (2) a high intensity synchrotron radiation station at the Cornell High Energy Synchrotron Source (CHESS) facility. The structure of [001] twist boundaries in Au and Ag is specifically addressed. The three-dimensional reciprocal space for a large angle boundary in a Au bicrystal is experimentally examined and a technique for measuring the width of the boundary is described.
Dissert. Abstr.

N83-29086 Cornell Univ., New York.
THEORY OF STRUCTURAL PHASE TRANSITIONS Ph.D. Thesis
Paul Drew Beale 1982 108 p
Avail: Univ. Microfilms Order No. DA8228383

The eigenvalues and eigenfunctions of the transfer operator are used to develop an exact renormalization group (RG) transformation for the phi(4) model of structural phase transitions in one dimension. The method is applicable over the entire range from the displacive limit to the order-disorder (Ising) limit. Analysis of the RG flow near the displacive limit and far from the fixed points enables us to identify a high-temperature Gaussian-like displacive region where phonon excitations dominate. At lower temperatures a crossover to order disorder behavior is driven by the formation of domain walls. The transformation is extended to two dimensions by using a Kadanoff-Migdal transformation and by using a direct decimation scheme. Phase diagrams are produced and the displacive region found in one dimension persists. The crossover which occurs above the critical temperature is still identified with the onset of domain wall formation. Near the displacive limit the critical temperature found by the decimation scheme agrees qualitatively with a rigorously derived function for T sub c in that limit. The double Gaussian model is then studied in the context of structural phase transitions. Dissert. Abstr.

N83-29087 Cornell Univ., New York.
QUASI-THREE-DIMENSIONAL, HIGH CURRENT DENSITY JOSEPHSON DEVICES Ph.D. Thesis
James Charles Brown 1982 295 p
Avail: Univ. Microfilms Order No. DA8228370

Development of very small, quasi-three dimensional, high critical current density Josephson tunnel junctions for high speed (switching) and high frequency (radiation detection) applications is addressed. The achievement of very small junction areas and high critical current densities is a fundamental requirement for such applications. Moreover, the use of a quasi-three dimensional geometry is important for minimizing the effects of heat and other nonequilibrium effects generated in junctions satisfying this requirement. Using X-ray lithography as a fabrication tool, a quasi-three dimensional, edge window ('gap') geometry was developed which allowed the production of Nb/Pb-Bi (S-I-S) <7 x 10 to the -10th power sq cm and with critical current densities exceeding 3.8 million amps sq cm. This represents the highest critical current density ever reported for tunnel junctions. These devices have inherent switching times below 1 psec and cut off frequencies well into the Tera-hertz range. Furthermore, phenomena usually associated with microbridge behavior (e.g., an extrapolated excess current and an 'electrode transition') were identified in the distinctly tunnel junction like I-V (current voltage) and dV/dI-V (dynamic resistance voltage) curves of these functions. Dissert. Abstr.

N83-29088# Texas A&M Univ., College Station. Dept. of Electrical Engineering.
GROWTH AND PREPARATION OF LEAD-POTASSIUM-NIOBATE (PKN) SINGLE CRYSTALS SPECIMENS Final Technical Report, Apr. 1980 - Sep. 1981
R. K. Pandey Hanscom AFB, Mass. RADC Dec. 1982 42 p refs
(Contract F19628-80-C-0038; AF Proj. 4600)
(AD-A125382; RADC-TR-82-211) Avail: NTIS HC A03/MF A01 CSCL 20/2

Lead-potassium-niobate, Pb2KNb5O15 (PKN) is a member of the family of tungsten-bronze materials of the type A6B10O30. It is both ferroelastic and ferroelectric and it can be considered as a pseudo-binary compound represented by 2PbNb2O6.KNbO3. Its piezoelectric and electromechanical properties make it the leading substrate material for the fabrication of temperature compensated surface-acoustic-wave (SAW) devices. However, it is very difficult to synthesize PKN as a large, crack-free and chemically homogeneous single crystal. This report deals primarily with the problems encountered in crystal growth of PKN and suggests means to circumvent them. Furthermore, it describes two new methods - top seeded and solution growth - to synthesize crack-free, stoichiometrically uniform large single crystals of the compound. Also the results of PKN characterization by means of X-ray diffraction and dielectric, optical and electrical conductivity measurements are presented and discussed here. GRA

N83-29089# Lincoln Lab., Mass. Inst. of Tech., Lexington.
InP MATERIALS Annual Technical Summary Report, 1 Oct. 1981 - 30 Sep. 1982
Gerald W. Iseler 30 Sep. 1982 50 p refs
(Contract F19628-80-C-0002; AF Proj. 2306)
(AD-A125348; ESD-TR-82-157) Avail: NTIS HC A03/MF A01 CSCL 20/2

This report covers the work on InP materials carried out with

support of the Department of the Air Force during the period 1 October 1981 through 30 September 1982. A part of this support was provided by the Rome Air Development Center. The current objectives of the program are to improve the yield of high-purity polycrystalline InP as source material for crystal growth and to optimize the liquid-encapsulated Czochralski (LEC) method in order to grow crystals with low dislocation density, low residual impurity concentration and uniform dopant concentration. GRA

N83-29090# Pennsylvania State Univ., University Park. Dept. of Materials Science and Engineering.
ION TRANSPORT IN Ca(2+), Sr(2+), Ba(2+) AND Pb(2+) BETA ALUMINAS
R. Seevers, J. DeNuzzio, G. C. Farrington, and B. Dunn (California Univ., Los Angeles) 7 Mar. 1983 21 p refs
(Contract N00014-81-K-0526)
(AD-A125691; TR-2) Avail: NTIS HC A02/MF A01 CSCL 20/2

Single crystals of Ca(2+), Sr(2+), Ba(2+), and Pb(2+) beta alumina were prepared from sodium beta alumina by ion exchange. The ionic conductivities of Ca2+, Sr2+, and Ba2+ beta alumina are comparable, about 2-4x10-2 (ohm-cm)-1 at 300 C. Surprisingly, Pb(2+) beta alumina is much more conductive, 1.5x10-1 (ohm-cm)-1 at 300 C and 4.6x10-3 (ohm-cm)-1 at 40 C. Its conductivity approaches that of sodium beta alumina at temperatures below 25 C. The diffusion coefficient for Sr(2+) in beta alumina at 600 C was estimated from radiotracer experiments. It is consistent with that expected from conductivity measurements. GRA

N83-29091# Rome Air Development Center, Griffiss AFB, N.Y.
TEMPERATURE COEFFICIENTS OF THE ELASTIC CONSTANTS OF QUARTZ Report, Jan. 1981 - Jun. 1982
Alfred Kahan Aug. 1982 33 p refs
(AF Proj. 2305)
(AD-A125709; RADC-TR-82-224) Avail: NTIS HC A03/MF A01 CSCL 09/1

Algebraic expressions are derived for relating the temperature coefficients of frequency of crystallographically doubly rotated quartz plates to the temperature coefficients of the elastic constants. A new set of elastic constant temperature coefficients are computed, based on a 100-120 experimental point data set. GRA

N83-29092# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
CALIBRATION RELATIONSHIPS FOR OPTICALLY MEASURING THE CONCENTRATIONS OF BORON, GALLIUM, AND INDIUM IN SILICON M.S. Thesis
John Joseph Rome Dec. 1982 87 p refs
(AF Proj. 2306)
(AD-A125670; AFIT/GEP/PH/82D-29) Avail: NTIS HC A05/MF A01 CSCL 07/4

New, more effective calibration relationships have been experimentally determined which enable FTIR absorption spectroscopy to accurately measure the impurity concentrations of In, Ga, and B in silicon. The peak areas of the Group III acceptor related spectra, are shown to behave linearly with concentration 1/3 or concentration 2/3, rather than simply being proportional to concentration as was previously assumed. These calibration relationships were determined for optical measurements made on samples cooled to 5 K for In and Ga, and to 5-8 K for B. The relationships for some lines of Ga and In were tested and found to still be accurate for sample temperatures up to 9 K. From the high resolution optical measurements made in this study, previously unobserved acceptor related spectral lines were seen. These new lines were observed in the P3/2 spectra of In, Ga, Al, and B. Also a 5p' was observed in the P1/2 spectra of Ga. A feature in each acceptor's P3/2 spectrum is defined as EI, the ground state binding energy, and the spin-orbit splitting of the silicon valence bands was measured. All the IR induced excited states of In, Ga, Al, and B were measured. After renumbering of the B lines 5 - 11, a more complete correspondence between all the Group III excited state lines was shown than any published previously. GRA

N83-29093# Sandia Labs., Albuquerque, N. Mex.
ELECTRONIC PROPERTIES OF SUPERLATTICES
G. C. Osbourn 1982 20 p refs Presented at the Intern. Conf. on Metastable and Modulated Semiconductor Structures, Pasadena, Calif., 6 Dec. 1982
(Contract DE-AC04-76DP-00789)
(DE83-003709; SAND-82-2810C; CONF-821219-3) Avail: NTIS HC A02/MF A01

The electronic properties of semiconductor superlattices which can be intentionally varied by changing their quantum well structures, are discussed. New flexibility in varying superlattice electronic properties occurs in strained layer superlattices, since lattice mismatched materials can be used for the individual layers. The flexible choice of layer materials and layer thicknesses in strained layer superlattices makes possible the tailoring of various superlattice electronic properties to desired values. Calculated values for several adjustable material properties in ternary strained layer superlattices are presented to illustrate this tailorability. DOE

N83-29094# California Univ., Berkeley. Lawrence Berkeley Lab. Materials and Molecular Research Div.
PHOTO-EXCITED STATES IN GERMANIUM AT LIQUID-HELIUM TEMPERATURES Ph.D. Thesis
James Clifford Culbertson Dec. 1982 202 p refs
(Contract DE-AC03-76SF-00098)
(DE83-006188; LBL-15472) Avail: NTIS HC A10/MF A01

A wide variety of experimental work dealing with the basic properties of photoexcited states in Ge at liquid helium temperatures is presented. The primary emphasis is on the electron hole liquid (EHL) and the free exciton (FE). The EHL is composed of two interpenetrating Fermi liquids, one of electrons and one of holes, each with its own Fermi level. The FE dealt with here is a mobile, loosely bound state of an electron and a hole. The first absolute measurement of the density dependence of the enhancement factor g/sub eh/(0) for the EBL in Ge. This factor g/sub eh/(0) is a measure of the electron hole spatial correlation function, and provides a valuable and sensitive test for the predictions of various many body theory approximations. An EHL droplet - FE gas system confined to a strain induced potential well was used. The measurement approach relied on only a few simple and verifiable assumptions. DOE

N83-29095# Brookhaven National Lab., Upton, N. Y.
CONCENTRATION PROFILE OF HYDROGEN NEAR THE SURFACE OF NIOBIUM
M. A. Pick, A. Hanson, K. W. Jones, and A. N. Goland 1982 7 p refs Presented at the Intern. Symp. on the Electronic Structure and Properties of Hydrogen in Metals, Richmond, 4 Mar. 1982
(Contract DE-AC02-76CH-00016)
(DE82-009880; BNL-30904; CONF-820325-7) Avail: NTIS HC A02/MF a01

Different surface conditions of samples hydrided in two different ways were investigated. The materials used were thin foils (50 micrometer MARZ grade) of niobium, 10 x 25 mm in size. The samples were outgassed and cleaned in UHV to remove virtually all the interstitial impurities from the bulk and surface. A small spot of Pd was then deposited onto the clean surface of the niobium in situ in the UHV system by evaporation from a hot Pd filament. In the second method a sample was placed in the hydriding unit and allowed to absorb a premeasured amount of hydrogen while cooling from approximately 800 C where the surface oxide is dissolved into the bulk. To study the effect of a poor vacuum in the hydriding unit, samples were heated to 800 C in different base pressures prior to the admission of hydrogen. One sample was heated in 0.00005 Torr oxygen. DOE

N83-29096# Sandia Labs., Albuquerque, N. Mex.
EXTENDED LOCAL MIXING MODEL FOR HYDROGEN RETENTION AND ISOTOPE EXCHANGE
D. K. Brice, B. L. Doyle, and W. R. Wampler 1982 29 p refs Presented at the 5th Intern. Conf. on Plasma Surface, Gatlinburg, Tenn, 3-5 May 1982
(Contract DE-AC04-76DP-00789)

(DE82-014088; SAND-82-0058C; CONF-820545-1) Avail: NTIS HC A03/MF A01

The previously reported Local Mixing Model (LMM) for hydrogen retention and isotope exchange is extended to include thermal release of the hydrogen from its trap sites. In addition, a new mechanism for beam enhanced thermal transport (BETT) is described which accounts for a major portion of the thermal release at elevated temperatures. BETT involves the beam-induced promotion of trapped hydrogen from stronger traps to weaker traps and arises naturally from the basic concepts of the LMM. Comparison of the predictions of the model for hydrogen retention and isotope exchange at elevated temperatures in graphite and TiC show good agreement between experiment and theory. DOE

N83-29097# Argonne National Lab., Ill.
THRESHOLD ENERGY SURFACE AND FRENKEL-PAIR RESISTIVITY FOR Cu
Wayne E. King, K. L. Merkle, and M. Meshii (Northwestern Univ.) 1982 40 p refs Presented at the TMS/AIME Fall Meeting, St. Louis, 24 Oct. 1982
(Contract W-31-109-eng-38; Grant NSF DMR-81-14845)
(DE83-008694; CONF-821049-18) Avail: NTIS HC A03/MF A01

In-situ electrical resistivity damage-rate measurements in the high voltage electron microscope have been used to study electron-irradiation-induced defect production in copper single crystals at T < 100 K. Analysis of the directional and energy dependence yields a threshold energy surface that is significantly different from those of previous investigations: two pockets of low threshold energy centered at < 100 > and < 110 > surrounded by regions of much higher threshold energy. The corresponding damage function exhibits a plateau of 0.6 Frenkel pairs. The present results imply a Frenkel pair resistivity for C of (2.75 sub -0.2//sup +0.6/) x (LAMBDA) -cm. DOE

N83-29098# Mound Lab., Miamisburg, Ohio.
HYDROGEN DIFFUSION BEHAVIOR IN TITANIUM-CHROMIUM HYDRIDES WITH LAVES STRUCTURES
R. C. Bowman, Jr., B. D. Craft, A. Attalla, and J. R. Johnson (Brookhaven National Lab.) Jun. 1982 10 p refs Presented at the World Hydrogen Energy Conf., Pasadena, Calif., 13 Jun. 1982
(Contract DE-AC04-76DP-00053)
(DE82-011665; MLM-2901; CONF-820605-5) Avail: NTIS HC A02/MF A01

Extensive NMR measurements of the proton relaxation times have been performed on low (i.e., alpha-phase) and intermediate (i.e., alpha-phase) hydrogen concentrations in TiCr2H/sub x/ with both the hexagonal C14 and cubic C15 Laves structures. The relaxation times indicate rapid diffusion rates above 200 K for all the TiCr2H/ sub x/ phases; however, large differences in the diffusion activation energies are observed. This behavior is associated with the hydrogen interstitial site occupancies and diffusion pathways becoming restricted in the C14 structure. DOE

N83-29099# California Univ., Berkeley. Lawrence Berkeley Lab. Materials and Molecular Research Div.
ELECTRONIC, MAGNETIC AND CHEMICAL PROPERTIES OF FILMS, SURFACES AND ALLOYS Ph.D. Thesis
Jerry David Tersoff May 1982 89 p refs
(Contract W-7405-eng-48)
(DE82-018622; LBL-14484) Avail: NTIS HC A05/MF A01

Calculations for a variety of nickel and copper systems, performed in order to develop a coherent picture of the electronic, magnetic and chemical properties of transition-metal surfaces, films and alloys are described. From the results of these calculations a unified picture of important physical mechanisms emerges. These results explain the magnetic behavior of such systems, and are also suggestive of important mechanisms affecting the surface chemical properties. In the latter case, however, no clear conclusion is possible, because of the complexity of the processes involved. DOE

N83-29100# California Univ., Berkeley. Lawrence Berkeley Lab. Materials and Molecular Research Div.
MECHANISMS OF ACCOMMODATION OF DEFORMATION AT GRAIN BOUNDARIES IN BCC MATERIALS Thesis
Eduardo Alberto Kamenetzky Jun. 1982 62 p refs
(Contract DE-AC03-76SF-00098)
(DE82-018805; LBL-14613) Avail: NTIS HC A04/MF A01

Two of the mechanisms of accommodation of deformation at grain boundaries in body-centered cubic material were studied using transmission electron microscopy and diffraction. These are: the absorption of dislocations in near-coincidence boundaries and the accommodation of a change in GB plane in a low angle boundary. The contribution of these mechanisms to the continuation of plastic flow, the accommodation of an intergranular crack, and deformation mechanisms at high temperatures such as grain boundary sliding and grain boundary migration is discussed. The O-lattice geometrical description of interfaces was used to model the structure of the grain boundaries. A program was developed for the routine calculation of grain boundary structure and for comparison with experimental observations. Lattice dislocations are shown to dissociate in near-coincidence boundaries into dislocations with Burgers vectors characteristic of a lattice associated with the coincidence site lattice. DOE

N83-29101# Sandia Labs., Albuquerque, N. Mex.
BANDSTRUCTURE OF IMPURITY SHEET DOPED SUPERLATTICE ALLOYS
Harold P. Hjalmarson 1982 16 p refs Presented at the 9th Ann. Conf. of Phys. and Chem. of Semiconductor Interfaces, Pacific Grove, Calif., 27 Jan. 1982
(Contract DE-AC04-76DP-00789)
(DE82-007761; SAND-82-0339C; CONF-820124-2) Avail: NTIS HC A02/MF A01

The bandstructure and density of states for large superlattices of (100) Ga-site Ge and As-site N impurity-sheets in GaAs was calculated by a semi-empirical tight-binding technique. Both of these two-dimensional conduction-band derived bands have a J-point indirect minimum which is deep in energy, approximately 0.5 eV, relative to the bulk conduction bandage. It is shown that, in general, a planar defect localizes or binds one or more states. It is suggested that the large binding energies of these sheets will confine electric-field-accelerated carriers and thus such superlattices will be highly conductive parallel to the impurity sheets. DOE

N83-29102# California Univ., Berkeley. Lawrence Berkeley Lab. Dept. of Materials and Molecular Research.
QUANTUM NOISE IN JOSEPHSON JUNCTIONS AND dc SQUIDS
Roger Hilsen Koch May 1982 104 p refs
(Contracts W-7405-eng-48; DE-AC03-76SF-00098)
(DE82-016664; LBL-14275) Avail: NTIS HC A06/MF A01

The development of a model to predict and understand the effects of quantum noise in the resistively shunted Josephson junction and experimental tests of this model is described. The noise arises from zero-point current fluctuations in the shunt resistor that are mixed down from near the Josephson frequency to the much lower measurement frequency. Experimental data are in excellent agreement with these predictions, demonstrating clearly the measurability of zero-point fluctuations and the validity when less than or equal to I0 of the Langevin treatment combined with the Callen-Welton expression for the noise from a resistor. The rounding of the current-voltage characteristic when less than or equal to I0 caused by quantum noise and macroscopic quantum effects are briefly discussed. The noise temperature of a dc superconducting quantum interference device (SQUID) coupled to a tuned input circuit is computed using the complete quantum expression for the eqilibrium noise in the shunt resistance of each junction. DOE

N83-29103# Illinois Univ., Urbana. Dept. of Computer Science.
ITERATIVE ALGORITHMS FOR TRIDIAGONAL MATRICES ON A WSI-MULTIPROCESSOR
D. D. Gajski, A. H. Sameh, and J. A. Wisniewski (Sandia Labs., Albuquerque, N. Mex.) 1982 8 p refs Presented at the Intern. Conf. on Parallel Processing, Belaire, Mich., 24 Aug. 1982

(Contract DE-AC04-76DP-00789)
(DE82-017572; SAND-82-1533C; CONF-820829-1) Avail: NTIS HC A02/MF A01

With the rapid advances in semiconductor technology, the construction of Wafer Scale Integration (WSI)-multiprocessors consisting of a large number of processors is now feasible. The implementation of some basis linear algebra algorithms on such multiprocessors is illustrated. DOE

N83-29104# California Univ., Berkeley. Lawrence Berkeley Lab. Dept. of Materials Science and Mineral Engineering.
A STEM X-RAY MICROANALYTICAL STUDY OF PHOSPHOROUS SEGREGATION TO GRAIN BOUNDARIES IN THIN-FILM SILICON M.S. Thesis
Jamie H. Rose Jun. 1982 37 p refs
(Contract DE-AC03-76SF-00098)
(DE82-018719; LBL-14614) Avail: NTIS HC A03/MF A01

Stem X-ray microanalysis was applied in the characterization of phosphorus segregation to individual grain boundaries in thin film silicon. Heavily doped material annealed between 650 C and 800 C was examined. The extent of segregation varied from boundary to boundary in a given sample. This leads to an average segregation energy of 7.5 Kcal/mole. Using the coincident site lattice model of grain boundary structure, the amount of segregation for a few boundaries was correlated with boundary type. It appears that geometrical models may have some basis for predicting structural and energetic features of diamond structure materials. DOE

N83-29105# Oak Ridge National Lab., Tenn. Solid State Div.
DISLOCATION-FREE ZONE THEORY OF FRACTURE
S. J. Chang (Union Carbide Corp.) and S. M. Ohr 1982 5 p refs Presented at the 9th US Natl. Congr. of Applied Mech., Ithace, N.Y., 21 Jun. 1982
(Contract W-7405-eng-26)
(DE82-017402; CONF-820614-5) Avail: NTIS HC A02/MF A01

Observations by electron microscopy show the presence of a dislocation free zone (DFZ) between the crack tip and a linear pileup of dislocations in the plastic zone. A singular integral equation was formulated to describe the equilibrium configuration of the dislocations. The distribution function of the dislocations and the stress intensity factor were obtained in terms of elliptic integrals. It was found that the stress intensity factor is directly related to the length of the DFZ. The formation of the DFZ and the ductile brittle nature of fracture are discussed based on the mechanism of dislocation emission at the crack tip proposed by Rice and Thomson. DOE

N83-29106# Brookhaven National Lab., Upton, N. Y.
HADRON MASS ESTIMATES IN THE LATTICE GAUGE THEORY
Herbert Hamber 1982 74 p refs Presented at the 6th Workshop on Current Probl. in High Energy Particle Theory, Florence, 2 Jun. 1982
(Contract DE-AC02-76CH-00016)
(DE82-018965; BNL-31512; CONF-820684-1) Avail: NTIS HC A04/MF A01

Some estimates for the hadron masses in lattice QCD are presented in the approximation of neglecting dynamic fermion loops. Both light and heavy quark systems are considered and their dependence on the coupling constant and the quark mass is studied. Some results for the decay amplitudes are also given. How the eta prime mass can be computed to lowest order in n/sub f/, the number of dynamic fermion flavors, is discussed. DOE

N83-29107# Argonne National Lab., Ill. Materials Science Div.
DIFFUSION MECHANISMS IN GRAIN BOUNDARIES IN METALS
N. L. Peterson 1982 18 p refs Presented at the Diffusion in Metals and Alloys Conf., Tihany, Hungary, 29 Aug. 1982
(Contract W-31-109-eng-38)
(DE83-007785; CONF-8208118-1) Avail: NTIS HC A02/MF A01

A critical review is given of our current knowledge of models and mechanisms for grain boundary diffusion in metals. A pipe mechanism of diffusion based on the well established dislocation model seems most appropriate for small angle boundaries. Open channels, which have atomic configurations somewhat like dislocation cores, probably play a major role in large angle grain boundary diffusion. Dissociated dislocations and stacking faults are not efficient paths for grain boundary diffusion. The diffusion and computer modelling experiments are consistent with a vacancy mechanism of diffusion by a rather well localized vacancy. The effective width of a boundary for grain boundary diffusion is about two atomic planes. DOE

N83-29108# Argonne National Lab., Ill. Materials Science Div.
DIFFUSION MECHANISMS IN GRAIN BOUNDARIES IN SOLIDS
N. L. Peterson 1982 40 p refs Presented at the 84th Ann. Meeting of the Am. Ceramic Soc., Cincinnati, 2-5 May 1982
(Contract W-31-109-eng-38)
(DE83-007731; CONF-820547-16) Avail: NTIS HC A03/MF A01

Current knowledge of grain boundary diffusion in solids is reviewed. A pipe mechanism of diffusion based on the well established dislocation model seems most appropriate for small angle boundaries. Open channels, which have atomic configurations somewhat like dislocation cores, probably play a major role in large angle grain boundary diffusion. Dissociated dislocations and stacking faults are not efficient paths for grain boundary diffusion. The diffusion and computer modeling experiments are consistent with a vacancy mechanism of diffusion by a rather well localized vacancy. The effective width of a boundary for grain boundary diffusion is about two atomic planes. The general features of grain boundary diffusion, deduced primarily from experiments on metals, are thought to be equally applicable for pure ceramic solids. The ionic character of many ceramic oxides may cause some differences in grain boundary structure from that observed in metals, resulting in changes in grain boundary diffusion behavior. DOE

N83-29109# California Univ., Berkeley. Lawrence Berkeley Lab.
MOLECULAR-BEAM STUDIES OF ENERGY TRANSFER IN SCATTERING FROM CRYSTAL SURFACES Ph.D. Thesis
William Leslie Guthrie Jan. 1983 239 p refs
(Contract DE-AC03-76SF-00098)
(DE83-009095; LBL-15516) Avail: NTIS HC A11/MF A01

Translational energy distribution and angular distributions of D2O produced from the reaction of incident D2 and O2 on Pt (III) were measured using a molecular beam-surface scattering apparatus and a time-of-flight spectrometer. Results are discussed in terms of nonequilibrium desorption model. A two-photon ionization spectrometer was built to investigate the internal rotational and vibrational energy distributions of NO scattered from Pt(III) surfaces. Significant energy transfer was observed in all three modes of translation, rotation and vibration. The translational energy of the scattered NO was found to be in equilibrium with the surface for T/sub s/ less than 900 K and for incident beam energies of 0.046 and 0.11 eV. The vibrational and rotational energy distributions were found to deviate from equilibrium distributions. These deviations appear to be dynamic effects in the desorption process. DOE

N83-29110# Boston Univ., Mass. Dept. of Physics.
DISPERSION OF THE REFRACTIVE INDEX NEAR THE ABSORPTION EDGE IN COMPOUND SEMICONDUCTORS
B. Jensen and A. Torabi 1982 17 p refs Presented at the Conf. on Laser Induced Damage in Opt. Mater., Boulder, Colo., 15 Nov. 1982 Submitted for publication
(Contract DE-AC02-79ER-10444)
(DE83-007501; DOE/ER-10444/7; CONF-821170-1) Avail: NTIS HC A02/MF A01

An analytical expression for the real part of the refractive index n near the fundamental absorption edge was calculated for a semiconductor in terms of experimentally known quantities. It is derived from a quantum mechanical calculation of the complex dielectric constant which assumes the band structure of the Kane

theory. The expression obtained is a function of band gap energy effective electron and heavy hole masses, the spin orbit splitting energy, the lattice constant, and the carrier concentration for n type or p type materials. The refractive index is given as a function of frequency and the basic material parameters listed above with no adjustable constants. Dispersion near the fundamental absorption edge, which was observed experimentally for a number of III-V and II-VI compounds, is predicted and its calculation enabled. Comparison of theory with available experimental data is given.
DOE

N83-29111# Argonne National Lab., Ill. Chemistry Div.
GENERATION OF BEAMS OF REFRACTORY-METAL CLUSTERS
S. Wexler, R. J. Riley, E. K. Parks, C.-R. Mao, and L. G. Pobo 1982 8 p ref Presented at the NATO Advan. Study Inst. on the Impact of Cluster Phys. in Mater. Sci. and Technol., Cap d'Agde, France, 13-25 Jun. 1982
(Contract W-7405-eng-38)
(DE83-007618; CONF-8206159-1) Avail: NTIS HC A02/MF A01

Interest in the physical and chemical properties of small metal clusters has recently stimulated the development of sources for the generation of molecular beams of metal clusters, since the collision-free environment of a beam has the advantage of permitting in-flight study of isolated species free of interference from surroundings. For example, spectroscopic studies utilizing tunable lasers are performed in the molecular beam environment. The elucidation of the physical and chemical properties of clusters of refractory metal atoms are analyzed, in particular those of the catalytically active transition metals. For these purposes we have built and tested two sources suitable for generation of cluster beams of refractory metals, one for continuous beams and the other for pulsed beams. DOE

N83-29112# Argonne National Lab., Ill. Materials Science and Technology Div.
EFFECT OF HELIUM PREINJECTION AND PRIOR THERMOMECHANICAL TREATMENT ON THE MICROSTRUCTURE OF TYPE 316 SS
A. Kohyama, G. Ayrault, A. P. L. Turner, and N. Igata (Tokyo Univ.) 1982 20 p refs Presented at the Fall Meeting of TMS-AIME, St. Louis, Mo., 25-28 Oct. 1982 Submitted for publication
(Contract W-31-109-eng-38)
(DE83-007743; CONF-821049-14) Avail: NTIS HC A02/MF A01

Samples of 316 SS were preinjected with 15 appM helium either hot (6500 C) or cold (room temperature) and irradiated with 3 MeV Ni(+) ions to a dose level of 25 dpa at 6250 C in order to test the validity of helium preinjection as a means of simulation of transmutant helium production. Results for preinjected and single-ion irradiated samples were compared to samples irradiated with 3 MeV Ni(+) and simultaneously injected with helium at a rate of 15 appM He/dpa (dual-ion irradiated samples). Preinjected samples exhibited bimodal cavity size distributions. Preinjected samples of solution annealed or solution annealed and aged material showed lower swelling than dual-ion irradiated samples. However, He preinjection in 20% cold worked samples showed greater swelling than dual-ion irradiated samples. DOE

N83-29113# Kernforschungsanlage, Juelich (West Germany). Inst. fuer Festkoerperforschung.
THE MAGNETISM OF THIN NICKEL AND COBALT FILMS IN CONTACT WITH NONMAGNETIC METALS Thesis - Tech. Hochschule, Aachen [DER MAGNETISMUS DUENNER NICKEL- UND KOBALTFILME IN KONTAKT MIT NICHTMAGNETISCHEN METALLEN]
I. Kramer Dec. 1982 55 p refs In GERMAN; ENGLISH summary
(JUEL-1818; ISSN-0366-0885) Avail: NTIS HC A04/MF A01

The behavior of nonhomogeneous magnetic systems is described. Ultrathin ferromagnetic films (in the monolayer range) condensed on top of nonmagnetic metallic substrates were investigated by the anomalous Hall effect. The ferromagnetic atoms in the interface possess different magnetic properties than in the bulk. Nickel on top of polyvalent substrates (Mg, In, Sn) shows no magnetic moment up to a coverage of 2.5 to 3 atomic layers (nearly independent of the substrate's valence). However, Ni films condensed onto noble metals have a magnetic moment even for a monolayer. The behavior of magnetic surface impurities was investigated. Cobalt has a magnetic moment down to a coverage of 1/50 monolayer on noble metal surfaces. This surface behavior is compared to the magnetism of Co atoms in the bulk of noble metals, and it is shown that even for a proportion of 1,2% of Co there is no magnetic moment. Author (ESA)

N83-29114# European Space Agency, Paris (France).
DETERMINATION OR RE-EVAPORATION DURING VACUUM BALANCE QUARTZ CRYSTAL (VBQC) OUTGASSING TESTS
J. Dauphin (ESTEC, Noordwijk, Netherlands) and G. Premat (ESTEC, Noordwijk, Netherlands) Mar. 1983 16 p ref
(ESA-STM-227; ISSN-0379-4075) Avail: NTIS HC A02/MF A01

Temperature profiles in a quartz crystal matrix (QCM) were measured as a function of nominal temperatures obtained in the cooling fluid during an outgassing experiment, and of oven temperature. Analysis shows that separate calibration of the VBQC-type equipment is needed if QCM front-face temperatures are to be evaluated and the reevaporation is to be correctly interpreted. Author (ESA)

N83-29115# European Space Agency, Paris (France).
FURTHER COMMENTS ON THE INTERPRETATION OF THE VACUUM BALANCE QUARTZ CRYSTAL (VBQC) OUTGASSING TEST
J. Dauphin (ESTEC, Noordwijk, Netherlands) Mar. 1983 21 p refs
(ESA-STM-228; ISSN-0379-4075) Avail: NTIS HC A02/MF A01

It is shown that outgassing data obtained with a standard compound on the ESTEC VBQC 1 equipment can be corrected to obtain a full representation of the outgassing and condensation kinetics of quartz crystals. A standard methodology is proposed for running VBQC and similar tests in a cost effective manner.
Author (ESA)

77 THERMODYNAMICS AND STATISTICAL PHYSICS

Includes quantum mechanics; and Bose and Fermi statistics.

For related information see also *25 Inorganic and Physical Chemistry* and *34 Fluid Mechanics and Heat Transfer.*

N83-29116 Michigan Univ., Ann Arbor.
NUMERICAL SIMULATION OF THE TURBULENT RAYLEIGH-BENARD PROBLEM USING SUBGRID MODELING Ph.D. Thesis
Thomas Mason Eidson 1982 186 p
Avail: Univ. Microfilms Order No. DA8224940

A computer model was developed to simulate the three dimensional flow and convective heat transfer of a horizontal layer of fluid heated from below. The subgrid method uses a spatial convolution average that filters only the very small flow scales. The subsequently formed turbulent Reynolds stresses and heat fluxes can be modeled with a form that is applicable to a wide range of flows. The turbulent stresses and heat fluxes were modeled with an eddy viscosity/diffusivity assumption. An algebraic model was used to model the eddy viscosity/diffusivity. A second-order finite difference model was used to simulate the conservation of momentum, energy and mass equations that have been modified to include the subgrid turbulence. The resulting computer model was used to simulate the flow for Ra from 3.8 x 10 to the 5th power to 7.8 x 10 to the 7th power. Dissert. Abstr.

N83-29117 Denver Univ., Colo.
FINITE DIMENSIONAL QUANTUM MECHANICS Ph.D. Thesis

Vladimir A. Naroditsky 1982 138 p
Avail: Univ. Microfilms Order No. DA8229127

The basic properties of nonrelativistic finite-dimensional quantum mechanics are presented. Position, momentum and Hamiltonian operators are introduced. Properties of position and momentum operators are studied. Dynamics of the particles is considered. An Approximation Theorem is proved: finite dimensional quantum mechanics approximates ordinary quantum mechanics and the approximation gets better as the dimension increases. Second quantization, the symmetric and antisymmetric Fock spaces are discussed. It is shown that the Hilbert space of a single nonrelativistic particle p is the second quantization of the finite-dimensional space. Creation, annihilation and field operators are introduced and represented in terms of differential operators. A theorem is proved which states that there is no conventional scattering in finite dimensional quantum mechanics. Irreducible representations of the symmetry group in a complete tensor are constructed. Physical applications to elementary particles and quarks are briefly discussed. Dissert. Abstr.

N83-29118# San Diego State Univ., Calif. Dept. of Chemistry.
HIGH-TEMPERATURE THERMODYNAMIC DATA FOR SPECIES IN AQUEOUS SOLUTION Final Report
J. W. Cobble, R. C. Murray, Jr., P. J. Turner, and K. Chen May 1982 197 p refs Sponsored by EPRI
(EPRI Proj. 1167-1)
(DE82-904370; EPRI-NP-2400) Avail: NTIS HC A09/MF A01

This final report summarizes the results of experimental and theoretical research on the high temperature thermodynamic properties of aqueous species important to nuclear reactor water chemistry. Methods of predicting thermodynamic functions are included for electrolytes up to 300 C where experimental data are lacking. Data in the literature are evaluated and tables of important equilibrium constants for 78 reactions encountered in corrosion and prcipitation in nuclear reactors are listed up to 300 C. Finally, tables of free energy functions from 0 to 300 C are given for 56 individual species. These data represented form a major compilation resulting from the most advanced experimental and theoretical methods. Illustrations of the use of the tables are given for problems involving pH control, precipitation, and corrosion. DOE

N83-29119# Chicago Univ., Ill.
TOPICS IN FINITE TIME THERMODYNAMICS
R. S. Berry 1983 7 p refs
(Contract DE-AC02-80ER-10646)
(DE83-009237; DOE/ER-10640/3) Avail: NTIS HC A02/MF A01

An engine which is constantly in contact with both its high temperature and its low temperature reservoirs was theoretically studied. Model calculations were made for such an engine in which the working fluid carries out a simple unimolecular isomerization. The performance of a thermodynamic system subject to periodic boundary conditions, modeling diurnal variations of solar input, the optimization of a distillation system by minimizing the entropy production were examined. A general theorem concerning the availability in finite term processes was proved. The group of transformations under which the Weinhold metric is invariant was found. DOE

N83-29120# Sandia Labs., Albuquerque, N. Mex. Computational Physics and Mechanics Div.
IMPROVEMENTS IN CSQII: A TRANSMITTING BOUNDARY CONDITION
J. Michael McGlaun Jun. 1982 56 p refs
(Contract DE-AC04-76DP-00789)
(DE82-018548; SAND-82-1248) Avail: NTIS HC A04/MF A01

A boundary condition that absorbs incident stress waves with very little reflection has been implemented in the two-dimensional Eulerian wavecode CSQII. This boundary condition allows inflow or outflow of material, includes the infuence of gravity, works with nonlinear materials and includes the influence of stress deviators. This boundary condition can effectively simulate semi-infinite homogeneous media exterior to the computational mesh. DOE

80 SOCIAL SCIENCES (GENERAL)

Includes educational matters.

No abstracts in this category.

81 ADMINISTRATION AND MANAGEMENT

Includes management planning and research.

N83-29121# Georgia Inst. of Tech., Atlanta. Production and Distribution Research Center.
MULTI-CRITERION LAYOUT EVALUATION: THE VALUE MEASUREMENT PROBLEM
Robert J. Graves, Leon F. McGinnis, and Raman Joneja Jun. 1982 29 p refs
(Contracts N00014-79-C-0779; N00014-80-K-0709)
(AD-A125693; PDRC-82-12) Avail: NTIS HC A03/MF A01 CSCL 12/1

This paper addresses the problem of explicitly incorporating multiple criteria in the selection of a facility layout. The approach is based on the composite criterion model of Srinivasan and Shocker and utilizes the concepts of intrinsic attributes, which are location-oriented, and flow attributes, which are interaction-oriented. A methodology is described in detail and illustrated by a small example. Author (GRA)

N83-29122# California Univ., Los Angeles. Water Resources Center.
APPROACH TO SOLVING A BASIN-WIDE WATER RESOURCES MANAGEMENT PLANNING PROBLEM WITH MULTIPLE OBJECTIVES
Peter W. F. Louie, William W.-G. Yeh, and Nien-Sheng Hsu Sep. 1982 41 p refs
(PB83-150052; CONTRIB-184; W83-01574; OWRT-A-077-CAL(3); ISSN-0575-4914) Avail: NTIS HC A03/MF A01 CSCL 13B

A multiobjective optimization procedure using the Constraint Linear Programming technique has been developed to assist water resources planners in their effort to establish a more unified basin-wide management plan - a plan which will simultaneously consider the three major aspects in a basin-wide planning, namely, water supply allocation, water quality control, and prevention of undesirable overdraft of the groundwater basin. This optimization procedure is designed to be applied in concert with a ground-water quantity-and-quality model and/or a river flow-and-mass transport model, and a model which routes the water from the supply sources to various demand points. The purpose is to attain a set of non-inferior management plans which fully consider all the interdependent elements represented by the simulation models. Author (GRA)

82 DOCUMENTATION AND INFORMATION SCIENCE

Includes information storage and retrieval technology; micrography; and library science.

For computer documentation see *61 Computer Programming and Software.*

N83-29123# Library of Congress, Washington, D. C.
WHO KNOWS? SELECTED INFORMATION RESOURCES ON AERONAUTICS AND ASTRONAUTICS
John A. Feulner, comp. Aug. 1982 60 p
(SL-82-32) Avail: NTIS HC A04/MF A01

Aeronautics and astronautics activities at NASA. The Depart-

ment of Transportation, Air Force, Army, and Navy are discussed. Author

N83-29124*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
BIBLIOGRAPHY OF LEWIS RESEARCH CENTER TECHNICAL PUBLICATIONS ANNOUNCED IN 1982
Apr. 1983 372 p
(NASA-TM-83335; E-1585; NAS 1.15:83335) Avail: NTIS HC A16/MF A01 CSCL 05B

The technical reporting that resulted from the scientific and engineering work performed and managed by the Lewis Research Center in 1982 is described. All the publications were announced in the 1982 issues of STAR (Scientific and Technical Aerospace Reports) and/or IAA (International Aerospace Abstracts). Included are research reports, journal articles, conference presentations, patents and patent applications, and theses. Author

N83-29125# California Univ., Livermore. Lawrence Livermore Lab. Dept. of Electronics Engineering.
LGF DATA-ACQUISITION SYSTEM
John Baker Jul. 1982 16 p
(Contract W-7405-eng-48)
(DE82-019228; UCID-19431) Avail: NTIS HC A02/MF A01

A flexible and powerful data acquisition system was developed at Lawrence Livermore National Laboratory (LLNL) for use in liquefied natural gas (LNG) dispersion experiments. The system consists of 51 solar-powered, portable data acquisition units, a van-based minicomputer control and data-recording system, 65 towers, and nearly 300 sensors. The complement of sensors includes methane gas sensors, thermocouples, anemometers, humidity sensors, and heat flux sensors. The system utilizes UHF radio telemetry for command and data transmission and is designed to acquire data from sensors distrubited over a large area with a diameter of up to 10 miles. Twenty of the portable data acquisition units acquire wind field data from two-axis anemometers. The remaining 31 data acquisition units are used to acquire data from a wide variety of sensors. Data acquisition rates and channel assignments are programmable. DOE

N83-29126# Oak Ridge National Lab., Tenn. Computer Sciences Div.
CONVERTING TO DBMS 20 FROM INTEGRATED DATA BASE MANAGEMENT SYSTEM (IDMS)
Joe L. Booher 1982 7 p Presented at the Spring DECUS Symp., Atlanta, 10-14 May 1982
(Contract W-7405-eng-26)
(DE82-014972; K/CSD/INF-81/34; CONF-820515-6) Avail: NTIS HC A02/MF A01

A multi-project procurement systems was developed for the Project Procurement and Control Department of the Planning and Control Division, Union Carbide, Oak Ridge Gaseous Diffusion Plant. This real-time system provides Union Carbide with information necessary for budgeting, scheduling, planning, and reporting procurement status to the Department of Energy. The system was initially designed and developed under IDMS on an IBM mainframe. A DEC 2020 was later purchased, and the procurement system was converted from IDMS to DBMS-20. Topics to be covered will include the procedures followed during the conversion, the differences and similarities of the two data base systems, and problems encountered during the conversion. DOE

N83-29127# Sandia Labs., Albuquerque, N. Mex. Instrumentation Development Div.
A STORED-DATA ACQUISITION SYSTEM
Gene C. Hauser and David E. Ryerson Feb. 1983 37 p
(Contract DE-AC04-76DP-00789)
(DE82-009384; SAND-83-0132) Avail: NTIS HC A03/MF A01

A simple inexpensive data acquisition system with the data stored in memory for read out after test completion and recovery of the test unit is described. The system is a general purpose device with eight analog input channels feeding an eight bit analog to digital converter operating at speeds to 4000 samples per second. The system is controlled by a microprocessor to allow easy adaptation to different data acquisition tasks with only software changes. DOE

N83-29128# European Space Agency, Paris (France).
CATALOGUE OF ESA PUBLICATIONS IN 1982
B. Battrick, comp. Feb. 1983 53 p
(ESA-SP-1047) Avail: NTIS HC A04/MF A01

Publications in astronautics, chemistry and materials, engineering, geosciences, life sciences, mathematics and computer sciences, physics, social sciences and space sciences are listed. Over 600 titles are available. Author (ESA)

N83-29129# INTASA, Inc., Menlo Park, Calif.
FLOW REDUCTION DEVELOPING A PUBLIC INFORMATION PROGRAM Final Report
Mar. 1982 120 p refs
(Contract EPA-68-01-6052)
(PB83-150508) Avail: NTIS HC A06/MF A01 CSCL 05B

The report pertains to wastewater flow reduction analysis and program planning. With increasing numbers of communities becoming interested in the potential benefits of flow reduction, and with the introduction of flow reduction analysis requirements into the treatment facilities planning (Step 1) phase of EPA's Construction Grants Program, a need was felt to provide guidance on flow reduction analysis procedures and on developing community programs. GRA

N83-29130# Executive Office of the President, Washington, D.C.
PUBLICATIONS OF THE EXECUTIVE OFFICE OF THE PRESIDENT, JANUARY 20, 1981 - DECEMBER 31, 1982 Quarterly Report
1983 5 p
(PB83-153627) Avail: NTIS HC A02/MF A01 CSCL 05B

The bibliography lists the publications issued by the components of the Executive Office of the President, and available for sale to the public. GRA

N83-29131# Oberlin Coll., Ohio. Div. of Information Science and Technology.
RESEARCH ON THE IMPACT OF A COMPUTERIZED CIRCULATION SYSTEM ON THE PERFORMANCE OF A LARGE COLLEGE LIBRARY. PART 2: THE CONSERVATIVE LIBRARY Report, 1978 - 1981
Katherine A. Frohmberg and William A. Moffett Dec. 1982 30 p refs
(Grant NSF IST-78-10821)
(PB83-154203) Avail: NTIS HC A03/MF A01 CSCL 05B

Since 1978, the libraries at Oberlin College have been assessing the impact of an automated circulation system on the quantity and quality of service to their patrons and the attitude of the patrons toward that service. This report describes measurements made at the music library from 1978-1981. The authors show that quality of service increased slightly but quantity of service and attitude of patrons toward that service did not change as a result of the implementation of the automated system. Possible causes for this effect are discussed. GRA

N83-29132# National Bureau of Standards, Washington, D.C. Library Div.
DATA BASES AVAILABLE AT THE NATIONAL BUREAU OF STANDARDS LIBRARY, 3RD EDITION
Diane Cunningham Oct. 1982 104 p
(PB83-155986; NBSIR-82-2594) Avail: NTIS HC A06/MF A01 CSCL 05B

An alphabetical listing of data bases available on line at the National Bureau of Standards (NBS) Library is listed by either acronym or full title of the data base. Other additional information includes description of the data base, period of coverage, producer(s), corresponding hard copy, principal sources and vendors. A general subject and a cross reference index to the data bases are also supplied. GRA

N83-28034*# Jet Propulsion Lab., California Inst. of Tech., Pasadena. Operations Sustaining Engineering Sect.
THE NETWORK INFORMATION MANAGEMENT SYSTEM (NIMS) IN THE DEEP SPACE NETWORK
K. J. Wales *In its* The Telecommun. and Data Acquisition Rept. 15 May 1983 p 85-88 ref (For primary document see N83-28025 17-12)
Avail: NTIS HC A09/MF A01 CSCL 05B

83 ECONOMICS AND COST ANALYSIS

Includes cost effectiveness studies.

N83-28022# Joint Publications Research Service, Arlington, Va.
COMMENTARY ON ECONOMIC BENEFITS FROM SPACE PROGRAM
I. Isachenko *In its* USSR Rept.: Space, No. 21 (JPRS-83430) 9 May 1983 p 105-111 Transl. into ENGLISH from Ekon. Gazeta (Moscow), no. 39, Sep. 1982 p 21 (For primary document see N83-28011 17-12)
Avail: NTIS HC A07

84 LAW AND POLITICAL SCIENCE

Includes space law; international law; international cooperation; and patent policy.

N83-29133# Committee on Appropriations (U. S. Senate).
DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT-INDEPENDENT AGENCIES APPROPRIATION BILL, 1984
Washington GPO 1983 110 p Rept. to accompany H. R. 3133 presented by the Comm. on Appropriations at the 98th Congr., 1st Sess., 13 Jun. 1983
(S-Rept-98-152) Avail: US Capitol, Senate Document Room

New budget authority for the Department of Housing and Urban Development, the Environmental Protection Agency, the National Aeronautics and Space Administration, the National Science Foundation, the Veterans Administration, and 14 other agencies, commissions, boards, corporation, institutes, and offices is recommended. For individual title, see N83-29134.

N83-29134# Committee on Appropriations (U. S. Senate).
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION RESEARCH AND DEVELOPMENT, INCLUDING SPACE FLIGHT, CONTROL AND DATA COMMUNICATIONS
In its Dept. of Housing and Urban Develop.-Independent Agencies Appropriation Bill, 1984 1983 p 60-66 (For primary document see N83-29133 17-84)
Avail: US Capitol, Senate Document Room

A research and development appropriation is recommended. The Space Transportation System, space science and application, technology utilization, aeronautics and space technology, and tracking and data acquisition are described. Construction of facilities and research and program management are also described. N.W.

85 URBAN TECHNOLOGY AND TRANSPORTATION

Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation.

For related information see *03 Air Transportation and Safety, 16 Space Transportation,* and *44 Energy Production and Conversion.*

N83-29135# Hochschule der Bundeswehr, Munich. (West Germany). Forschungsschwerpunkt Simulation und Optimierung Deterministischer und Stochastischer Dynamischer Systeme.
SIMULATION AND DEVELOPMENT OF A CONTROL FOR AN AERODYNAMICALLY-MAGNETICALLY COUPLED SYSTEM Ph.D. Thesis [SIMULATION UND REGLERENTWURE FUER EIN AERODYNAMISCH-MAGNETISCH GEKOPPELTES SYSTEM]
Ernst Schneider Nov. 1982 53 p refs In GERMAN
Avail: NTIS HC A04/MF A01

Simulated aerodynamic forces and moments of a 300 to 500 km/h magnetic suspension railway were used in an extended control concept with magnetic control. The vehicle motion is described by two independent differential equation systems, one for the symmetrical-lateral motion, the other for the unsymmetrical side motion. The main variable controled by the system is the forward speed. Disturbances such as component failure, rail sagging and wind effects are considered. The use of stabilizer fins with rudders and an adaptive control systems is discussed. Author (ESA)

N83-29136# Institute for Perception RVO-TNO, Soesterberg (Netherlands). Traffic Behavior Group.
INSTRUMENTED CAR AND DRIVING SIMULATION: MEASUREMENTS OF VEHICLE DYNAMICS
J. Godthelp, G. J. Blaauw, and A. R. A. vanderHoorst Dec. 1982 57 p refs
(IZF-1982-37; TDCK-77335) Avail: NTIS HC A04/MF A01

The motion characteristics of an automobile in the longitudinal and lateral direction are described mathematically. The coefficients of the model were determined for an instrumented car by a series of field tests. The results were implemented in mathematical models used in driving simulation research. Analog and digital computer programs, which describe the mathematical vehicle models, are presented. Author (ESA)

88 SPACE SCIENCES (GENERAL)

N83-29137 Max-Planck-Institut fuer Physik und Astrophysik, Garching (West Germany). Inst. fuer Extraterrestrische Physik.
[ACTIVITIES REPORT OF THE INSTITUTE FOR EXTRATERRESTRIAL PHYSICS] Annual Report, 1982
Jan. 1983 115 p refs In GERMAN Original contains color illustrations
(MPE-178) Copyright. Avail: Issuing Activity

Research into the ionosphere and auroras, magnetosphere and solar winds, particle beams in the magnetosphere and in interplanetary spaces is summarized. Tracking systems in infrared and X-ray astronomy as well as laboratory research are covered. Research into flare and burst incidents, low and high energy in gamma ray astronomy are treated. Carbon monoxide, NO and MgCa molecules were studied by fluorescent and excitation spectroscopy. Author (ESA)

89 ASTRONOMY

Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

N83-29138 Dartmouth Coll., Hanover, N.H.
AUTOMATIC SPECTRAL CLASSIFICATION Ph.D. Thesis
Michael Julian Kurtz 1982 206 p
Avail: Univ. Microfilms Order No. DA8223851

The use of cross correlation (C.C.), and techniques of Multivariate Analysis and Pattern Recognition in the classification of stellar spectra are presented using an array of spectroscopic standards observed at low (14A) resolution with a digital spectrophotometer. The HR diagram for the faint young open cluster Trumpler 1 was

obtained. C.C. is first used to investigate several possible methods of data reduction. The C.C. classification obtained using the optimum reduction techniques obtains a poor luminosity classification, and for nonsupergiants in the spectral range BO-M2 a mean error of 2.2 subtypes. Using Principal Component Analysis it was possible to separate O stars and supergiants earlier than A5 from the rest of the sample, thus resolving a systematic error in the C.C. classification, and achieving a modicum of luminosity discrimination. Dissert. Abstr.

N83-29139 Pennsylvania State Univ., University Park.
LUMINOSITY FUNCTION OF HIGH REDSHIFT QUASARS Ph.D. Thesis
Barbara Gaston Vaucher 1982 128 p
Avail: Univ. Microfilms Order No. DA8228953

Data from ten different emission line surveys are included in a study of the luminosity function of high redshift quasars. Five of the surveys are analyzed through microdensitometric techniques and the data for quasars are given. The uncertainties in magnitudes, redshifts, and line equivalent widths are assessed and found to be + or - 0.3 mag, + or - 0.04 in z and approximately 30%, respectively. Criteria for selecting the redshift range $1.8 < \text{or} = z < 2.5$ are discussed and the apparent magnitude distribution for quasars in that range is compared to that of UVX selected quasars. A separate sample of blue continuum objects is defined by examining the spectral continuum for confirmed quasars. The surface density of the blue objects compared to that of high redshift quasars in the same survey indicates the high redshift quasars comprise about 20% of the blue continuum objects. The completion limits of the surveys are examined in detail to establish the best sample for the study of the luminosity function. Dissert. Abstr.

N83-29140 Pennsylvania Univ., Philadelphia.
EXTRACTION OF STELLAR MASS DATA FROM BINARY STAR RADIAL VELOCITY CURVES: A SIGNAL PROCESSING APPROACH Ph.D. Thesis
Christopher Sean Sutton 1982 190 p
Avail: Univ. Microfilms Order No. DA8227324

Modern signal processing methods are used to extend our ability to extract mass data from binary star spectra. Such methods are appropriate for data from electronic detectors, as well as to the present large collection of photographic data. Considered here, in particular, is the situation of classically single spectrum binaries, where the individual lines of the secondary are below the level of human detectability. Techniques for determining the mass of the secondary component with the use of a priori knowledge are developed. The technique effectively integrates faint lines of several spectra at various phases. It does this by first cross correlating of the stellar spectrum with a synthetic spectrum. Then cross correlations of different phases are added under assumed orbital elements for the binary system. As a result, at the correct orbital semi-amplitude, a feature which reflects the summing of secondary absorption lines, appears at the system's center of mass velocity. The binary stars TV Ceti, CM Lacertae, MR Cygni, TW Cassiopeiae, Y Piscium and HDE 226868/Cyg X-1 were studied with this approach. Dissert. Abstr.

90 ASTROPHYSICS

Includes cosmology; and interstellar and interplanetary gases and dust.

N83-29141 Case Western Reserve Univ., Cleveland, Ohio.
THE SPACE DENSITY AND CLUSTERING PROPERTIES OF A NEW SAMPLE OF EMISSION-LINE GALAXIES Ph.D. Thesis
Anthony John Wasilewski 1982 120 p
Avail: Univ. Microfilms Order No. DA8224682

A 4 deg prism was used with IIIa-J emulsion to show that a sample of emission-line galaxies is available even in areas already searched with the 'excess UV-continuum' technique. The space density of the galaxies is similar to that of the Makarian galaxies. Cluster contour maps and the spatial correlation function suggest that there is weak clustering and possibly super-clustering within the sample itself and that the galaxies considered are about as common in clusters of ordinary galaxies as in the field. The clustering tendencies are interpreted in the context of a matter sweeping/infall scenario in which intracluster matter plays an important role in determining the gas content and star formation history of cluster galaxies. The data generally support the implication that the immediate environment in which a galaxy is located has significant effects on its evolution, possibly including energetic events in its nucleus. Dissert. Abstr.

N83-29142 Florida Univ., Gainesville.
THE MORPHOLOGY AND ENERGETICS OF DISCRETE OPTICAL EVENTS IN COMPACT EXTRAGALACTIC OBJECTS Ph.D. Thesis
Joseph Thomas Pollock 1982 188 p
Avail: Univ. Microfilms Order No. DA8226423

All available optical variability data for compact extragalactic objects were assembled. For objects showing evidence for one or more discrete events, this magnitude and data information was digitized, composite light curves generated and discrete events identified. All event data were converted to rest frame 2500 A monochromatic luminosities. The base luminosity was determined for and subtracted from each set of event data, and normalized event luminosity curves were generated. The morphology of these events was examined, both for single events and for groups of events. Determinations were made of event parameters such as the rest frame durations, 2500 A peak and base luminosities, event to base energy ratios, total event energies and shortest significant variability timescales. From these and object parameters, values were obtained for lower limits to the peak bolometric luminosities and event energies, as well as the maximum size of the emitting region and resulting limits on the energy densities. Under the assumptions of various models for these types of objects, further parameters such as mass accretion rates, total accreted masses, upper and lower limits on the mass of the central object and magnetic field strength limits were determined. Dissert. Abstr.

N83-29143 Maryland Univ., College Park.
CHARGE STATES OF HEAVY IONS IN THE ENERGY RANGE APPROXIMATELY 30 TO 130 keV/Q OBSERVED IN UPSTREAM EVENTS ASSOCIATED WITH THE EARTH'S BOW SHOCK Ph.D. Thesis
Antoinette Broe Galvin 1982 282 p
Avail: Univ. Microfilms Order No. DA8226458

The charge state composition was determined for twelve energetic (30 to 130 keV/Q) diffuse ion events observed upstream of the Earth's bow shock using the ultra low energy charge analyzer (ULECA) sensor of the Max-Planck-Institut/University of Maryland instrument on ISEE-1. The charge state composition of $Q > \text{or} = 3$ ions in these events is found to be constant as a function of energy per charge. In the framework of a Fermi-type acceleration model, this implies a specific form of the different coefficient. The $Q > \text{or} = 3$ charge state distributions, when evaluated at equal energy per charge, are consistent with expected solar wind values. It is suggested that the charge state composition of these locally accelerated heavy ions can be used to estimate the charge state composition in the solar wind, and hence to estimate the equilibrium coronal temperatures associated with a variety of solar wind flows. Average CNO ionization temperatures were determined for upstream events occurring during interstream, flare related, and coronal hole-associated solar wind flows. Dissert. Abstr.

N83-29144 Cornell Univ., Ithaca, N. Y.
PULSAR POLARIZATION: DUAL-FREQUENCY OBSERVATIONS AND THE PRODUCTION OF ORTHOGONALLY POLARIZED RADIATION Ph.D. Thesis
Daniel Richard Stineberg 1982 260 p
Avail: Univ. Microfilms Order No. DA8228477

Individual-pulse polarization observations were made at two frequencies: 800 MHz (Green Bank) and 1404 MHz (Arecibo). Simultaneous, milliperiod-resolution data from 4 pulsars (PSE 0834

+ 26, PSR 0950 + 08, PSR 1929 + 10, and PSR 2020 + 28) are presented along with 1404 MHz observations of 7 additional pulsars. A method to correct for cross-coupling in the telescope feed was developed and applied to the 1404 MHz observations. It was found that (1) polarization fluctuations, including transitions between orthogonal polarization states, are statistically broadband, (2) most pulsar radiation is an instantaneous superposition of orthogonal polarization states, (3) polarization randomization does not increase significantly between 430 and 1404 MHz, (4) single-pulse polarization fluctuations can be strongly frequency-dependent, and (5) position angle transitions at 800 MHz are usually accompanied by transitions at 1404 MHz. Production of elliptical, orthogonally polarized radiation (OPR) by the breakdown of normal mode propagation (mode-coupling) was investigated in detail. It was found that the transition from linearly polarized to circularly polarized normal modes occurs near the light cylinder. The onset of mode-coupling occurs much closer to the star than the ellipticity boundary, however, so mode coupling cannot explain elliptical OPR unless pulsar magnetospheres are drastically different than present models indicate. Dissert. Abstr.

N83-29145 Cornell Univ., Ithaca, N. Y.
HYDRODYNAMIC AND MAGNETOHYDRODYNAMIC ACCRETION FLOWS IN GALACTIC NUCLEI Ph.D. Thesis
Howard Allen Scott 1982 177 p
Avail: Univ. Microfilms Order No. DA8228471

A study is made of steady-state axisymmetric hydrodynamic and magnetohydrodynamic accretion of matter with angular momentum. The primary application in mind is to accretion of gaseous matter onto massive black holes at rates approx. < 1 solar mass/yr. In the case of a viscous, incompressible fluid, self-similar solutions arise naturally, reducing the Navier-Stokes equations to a set of nonlinear ordinary differential equations. Physical interpretations of the solutions show that these flows arise in response to point sources of momentum at the origin, in the + or - directions. For flows with non-constant specific angular momentum, there is a planar discontinuity which is interpreted as an accretion disc. In general, two flow regions appear on each side of the disc, corresponding to accretion onto the disc and jet-like outflows along the + or axes. The magnetic field alters the relative amounts of reversible and irreversible momentum and angular momentum transport by the flow and can act to suppress the level of turbulence present and decrease the effective viscosity. Axisymmetric gravitational accretion of a perfect fluid with angular momentum is also considered. The distinctive aspect of these flows is the existence of an empty vortex funnel, if the specific angular momentum of the fluid is non-zero near the symmetry axis. Applications of the results are made to extragalactic double radio sources. Dissert. Abstr.

N83-29146 Cornell Univ., Ithaca, N. Y.
NEUTRINO EMISSION DFROM A HOT, DENSE, PLANE-PARALLEL ATMOSPHERE IN HYDROSTATIC EQUILIBRIUM Ph.D. Thesis
Paul Joseph Schinder 1982 151 p
Avail: Univ. Microfilms Order No. DA8228469

Neutrino transport appropriate to the core collapse of a massive star is investigated by studying transport in a plane-parallel equilibrium atmosphere. The solution of this problem is numerical and is obtained by finite differencing the exact time-independent transport equation. This equation is an integro-differential equation which has three independent variables, corresponding to depth below the surface, neutrino energy, and neutrino direction cosine. The desired solution is constrained to be in hydrostatic equilibirum with constant gravitational acceleration g, to conserve total energy flux F, and to conserve lepton number flux (or, in the case of three flavored atmospheres, fluxes) N. Two different types of atmosphere are constructed. In the first, only electron neutrinos and antineutrinos are allowed to exist in the atmosphere. In the second, all three flavors of neutrino (electron, mu, and tau) are incorporated. Detailed formulae for the interaction functions necessary to describe electron, mu, and tau neutrino interactions with protons, neutrons, electrons, positrons and plasmons are also presented. Numerical calculations of the emitted spectra and the profiles of various parameters describing the state of the atmosphere for both one and three flavored are presented. Dissert. Abstr.

N83-29147 Texas Univ., Austin.
SIMULATIONS OF INTERACTING FRAGMENTS AND STAR FORMATION IN INTERSTELLAR CLOUDS Ph.D. Thesis
William Addison Pumphrey 1982 303 p
Avail: Univ. Microfilms Order No. DA8227712

Simulations of the evolution of a system of interacting protostellar fragments within an interstellar could were carried out. The interactions investigated include direct fragment collisions, the accretion of ambient cloud gas, the effect of drag upon the moving fragments, and the collapse of the fragments into protostars. The evolving mass spectra of the fragments is examined as well as the evolution of the fragment cloud system as a whole. Attention is focused on the effects that various initial conditions, such as initial mass distribution, initial velocity ditribution, the amount of system mass in the form of fragments, and the initial mean fragment density enhancement, have upon the system's evolution and the final protostellar mass spectrum. The relative importance of various physical effects are estimated by a timescale analysis. A kinetic equation is presented which describes the problem but is shown to be too complicated to solve for realistic systems. Dissert. Abstr.

N83-29148 Colorado Univ., Boulder.
RADIATION-DRIVEN STELLAR WIND MODELS Ph.D. Thesis
David Bruce Friend 1982 138 p
Avail: Univ. Microfilms Order No. DA8229830

Three models of radiation-driven stellar winds are based on the Castor, Abbott, and Klein (CAK) theory. The first model considers the effect of multiple scatterings in overlapping lines. A self-consistent wind model is found. The mass loss rate and terminal velocity are larger than in the CAK model, while the velocity law is shallower. This model might help explain the massive winds from Wolf-Rayet stars. In the second model the CAK theory is combined with the Weber and Davis model for a rotating magnetic solar wind. The velocity law is slightly shallower than in CAK. The mass loss rate and terminal velocity are both smaller, for all values of the rotational velocity and surface magnetic field strength. The model is for the wind in a massive X-ray binary system. The wind from the massive primary is influenced by the presence of the X-ray source. Its gravity and radiation pressure, and the centrifugal force due to orbital motion, desstroy the spherical symmetry of the wind and make the properties of the wind strongly dependent on the size of the primary. Dissert. Abstr.

N83-29149 Pennsylvania State Univ., University Park.
A SURVEY OF STAR-BURST GALACTIC NUCLEI Ph.D. Thesis
Vicki Ann Balzano 1982 137 p
Avail: Univ. Microfilms Order No. DA8228858

An extensive spectrophotometric survey of galaxies with star burst nuclei was conducted to investigate their basic astrophysical properties and to discover their relationship to other extragalactic objects. Observations of 102 star burst nuclei were obtained with the 1.6 m telescope of the Penn State Black Moshannon Observatory using a SIT vidicon detector. These objects, which were primarily selected from the Markarian lists, have spectra characterized by strong, narrow, low ionization emission lines. Their UBV colors, emission line properties, and radio continua can be consistently explained by the presence of a young, hot star population. The star burst nuclei are distinguishable from Seyfert nuclei at every wavelength. Dissert. Abstr.

N83-29150 Bayerische Akademie der Wissenschaften, Munich (West Germany). Deutsche Geodaetische Kommission.
GRAVITATIONAL INTERACTION OF EXPANDED BODIES [GRAVITATIONSWECHSELWIRKUNG AUSGEDEHNTER KOERPER]
Heinrich Gleixner 1982 49 p refs In GERMAN Sponsored by Technical Univ., Munich
(Ser-A-95; ISBN-3-7696-8177-0; ISSN-0065-5309) Copyright.

Avail: Issuing Activity

Rigorous expressions for potential energy, gravitational force, torque, gradient tensor, tidal potential, and tidal acceleration of two expanded bodies were deduced. These quantities are dependent on: two series of spherical harmonics coefficients characterizing the homogeneities of both bodies; a series of Euler angles allowing the transfer of the two coordinate systems into another; and a series of spatial polar coordinates describing the position of the center of gravity of one body in the coordinate system of the other body. Occurring series are evaluated by formula manipulation through Poisson series. This produces the extensive terms completely up to high orders. Author (ESA)

N83-29151*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

THE NEED FOR AN INTERMEDIATE MASS SCALE IN GUTS

Qaisar Shafi May 1983 16 p refs Presented at the Europhy. Study Conf. on Electroweak Effects at High Energies, Erice, Sicily, Feb. 1983

(NASA-TM-85039; NAS 1.15:85039; Rept-665) Avail: NTIS HC A02/MF A01 CSCL 03B

The minimal SU(5) grand unified field theory (GUT) model fails to resolve the strong charge parity (CP) problem, suffers from the cosmological monopole problem, sheds no light on the nature of the 'dark' mass in the universe, and predicts an unacceptably low value for the baryon asymmetry. All these problems can be overcome in suitable grand unified axion models with an intermediate mass scale of about 10 to the 11th power to 10 to the 12th power GeV. An example based on the gauge group SO(10) is presented. Among other things, it predicts that the axions comprise the 'dark' mass in the universe, and that there exists a galactic monopole flux of 10 to the -8th power to 10 to the -7th power/sq cm/yr. Other topics that are briefly discussed include proton decay, family symmetry, neutrino masses and the gauge hierarchy problem. M.G.

N83-29152*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

ON NEUTRON STAR STRUCTURE AND THE MILLISECOND PULSAR

Alice K. Harding May 1983 11 p refs Submitted for publication (NASA-TM-85040; NAS 1.15:85040) Avail: NTIS HC A02/MF A01 CSCL 03B

The recently discovered millisecond pulsar (PSR1937-214) is observed to be rotating close to the limit of dynamical instability for a neutron star. Despite its extremely rapid rotation, measurements of the period derivative put a stringent upper limit on the energy loss from gravitational radiation, thus requiring that the quadrupole moment be quite small. The pulsar must also be rotating below the critical frequency at which its equilibrium configuration would become non-axisymmetric, since the lifetime of this configuration against decay by gravitational radiation is very short. This critical frequency, given by the theory of rotating ellipsoids, imposes a restriction on the rotation rate more severe than the break-up frequency and may be used to set a lower limit, $< \rho > > 2 \times 10$ to the 14th power g/cu cm, on the density of the star. If the mass is 0.5 - 1.5 solar mass, several of the stiffer neutron star equations of state may be ruled out, and the radius should be less than 16 km. The condition for axisymmetry also imposes an upper limit on the rotation rate to which neutron stars may be spun up by accretion disks in binary systems, a model recently proposed for the evolution of the millisecond pulsar. Author

91 LUNAR AND PLANETARY EXPLORATION

Includes planetology; and manned and unmanned flights. For spacecraft design see *18 Spacecraft Design Testing, and Performance*. For space stations see *15 Launch Vehicles and Space Vehicles*.

N83-29153*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

STRUCTURE AND OTHER PROPERTIES OF JUPITER'S DISTANT MAGNETOTAIL

R. P. Lepping, M. D. Desch, L. W. Klein (Computer Sciences Corp.), E. C. Sittler, Jr., J. D. Sullivan (MIT), W. S. Kurth (Iowa Univ., Iowa City), and K. W. Behannon Jun. 1983 53 p refs Submitted for publication

(NASA-TM-85054; NAS 1.15:85054; MIT-CSR-P-83-1) Avail: NTIS HC A04/MF A01 CSCL 03B

Analyses of data from Voyager 2 experiments provide evidence for, and characteristics of, a Jovian magnetotail extending at least to 9,000 Jovian radii from the planet. During approximately (25 day) periodic sightings of the tail, the magnetic field tended to point radially towards or away from Jupiter, indicating preservation to large distances of the bipolar, lobe like structure observed near the planet. This periodicity, along with various properties of the solar wind at this time, indicates that the tail is apparently influenced by recurrent solar wind features. Anomalous magnetic fields, not aligned with the nominal tail axis, also exist within the tail, especially in the low density, central (core) region, indicating some complexity of internal structure. A.R.H.

N83-29154# Aerospace Corp., El Segundo, Calif. Space Sciences Lab.

AN ANALYSIS OF THE STRUCTURE OF SATURN'S MAGNETIC FIELD USING CHARGED PARTICLE ABSORPTION SIGNATURES

D. L. Chenette and L. Davis, Jr. (California Inst. of Technology) 1 Jun. 1983 34 p refs

(ATR-83(9558)-2) Avail: NTIS HC A03/MF A01

A technique is derived for determining the structure of Saturn's magnetic field. This technique uses the observed positions of charged particle absorption signatures due to the satellites and rings of Saturn to determine the parameters of an axially symmetric, spherical harmonic model of the magnetic field using the method of least squares. Absorption signatures observed along the Pioneer 11, Voyager 1, and Voyager 2 spacecraft trajectories are used to derive values for the orientation of the magnetic symmetry axis relative to Saturn's axis of rotation, the axial displacement of the center of the magnetic dipole from the center of Saturn, and the magnitude of the external field component. A comparison of these results with the magnetic field model parameters deduced from analyses of magnetometer data supports models which incorporate a northward offset of the dipole center by about 0.05 R(3). M.G.

N83-29155*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

OBSERVATIONAL CONSTRAINTS ON THE ATMOSPHERES OF URANUS AND NEPTUNE FROM NEW MEASUREMENTS NEAR 10 MICRON

Glenn S. Orton, Alan T. Tokunaga (Hawaii Univ., Honolulu), and John Caldwell (State Univ. of N.Y., Stony Brook) [1982] 46 p refs

(Grant NASw-3159)

(NASA-CR-172703; NAS 1.26:172703) Avail: NTIS HC A03/MF A01 CSCL 03B

Uranus was detected at 10.3, 11.6 and 12.5 micrometers approximately 1 micrometer spectral bandpasses, with respective brightness temperatures of 74.0 + 0.9 or -1.1, 67.6 + 0.5 or -0.7, and 65.5 + 0.6 or -0.7 K and the first detection of Neptune at 10.3 micrometers with a brightness temperature of 7 7.5 + 0.7 or -0.9 K. We also detected Neptune at 11.36 micrometers with 2% spectral resolution at 81.0 + 0.8 or -0.9 K. The 10 micrometers continuous of both Uranus and Neptune may in part be due to reflected solar radiation as well as thermal emission. If all of the observed flux is reflected light, then the maximum geometric albedo of Uranus is 0.115 + or - 0.020, and that of Neptune is 0.229 + or - 0.043. In the context of previous observations in this region, the maximum stratospheric C2H6 mixing ratio is found to be 3 x 10 to the -8 power for Uranus and

3 x 10 to the -6 power for Neptune. A value for the maximum mixing ratio in the stratosphere of Neptune on the order of 1 - 0.004 appears to be consistent with the available data. Author

N83-29156*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
EXPERIMENTS USING ATMOSPHERIC FORCING FROM A FGGE ANALYSIS TO DRIVE AN UPPER OCEAN MODEL
Alejandro Camerlengo Jun. 1983 88 p refs
(NASA-TM-85038; NAS 1.15:85038) Avail: NTIS HC A05/MF A01 CSCL 03B

Results are presented of a series of numerical experiments in which an upper ocean model is driven by surface heat fluxes and stress fields derived from the FGGE SOP-1 GLAS analysis/forecast system (Halem, et al., 1982). The model results show that most changes in the mixed layer height and horizontal velocity occurs in the first days. On the other hand, changes in the temperature field take a longer time to develop. In the most realistic case (real initial conditions, instantaneous forcing fields from the atmospheric analysis), the resulting changes in temperature were larger than observed and the correlation between observed and predicted changes was poor. The deficiency in the forecast of SST changes may be due to several factors: lack of sufficient ocean resolution, improper initialization, lack of feedback between the ocean and the atmosphere and the absence of transports by the strong boundary currents, and perhaps unrealistic surface fluxes of heat and momentum. Unless these problems are alleviated it is not reasonable to perform coupled atmospheric ocean forecasts. Author

N83-29157*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
OBSERVATIONS OF THE 10 MICROMETER NATURAL LASER EMISSION FROM THE MESOSPHERES OF MARS AND VENUS
D. Deming, F. Espenak, D. Jennings, T. Kostiuk, and M. J. Mumma Jun. 1983 26 p refs
(NASA-TM-85044; NAS 1.15:85044) Avail: NTIS HC A03/MF A01 CSCL 03B

Observations of the total flux and center to limb dependence of the nonthermal emission occurring in the cores of the 9.4 and 10.4 micrometers CO2 bands on Mars are compared to a theoretical model based on this mechanism. The model successfully reproduces the observed center to limb dependence of this emission, to within the limits imposed by the spatial resolution of the observations of Mars and Venus. The observed flux from Mars agrees closely with the prediction of the model; the flux observed from Venus is 74% of the flux predicted by the model. This emission is used to obtain the kinetic temperatures of the Martian and Venusian mesospheres. For Mars near 70 km altitude, a rotational temperature analysis using five lines gives T = 135 + or - 20 K. The frequency width of the emission is also analyzed to derive a temperature of 126 + or - 6 K. In the case of the Venusian mesosphere near 109 km, the frequency width of the emission gives T = 204 + or - 10 K. A.R.H.

N83-29158# Massachusetts Inst. of Tech., Cambridge.
COMPOSITION AND SOURCES OF HEAVY IONS IN THE OUTER KRONIAN MAGNETOSPHERE
A. Eviatar, G. L. Siscoe, R. L. McNutt, and J. D. Sullivan [1982] 30 p refs
(CSR-P-82-4) Avail: NTIS HC A03/MF A01

The Voyager 1 Plasma Science (PLS) experiment observed heavy ions near the equatorial plane of Saturn. The plasma density, as masured by the electrons, increased precipitously at L = 18 on both the inbound and outbound passes and continued to increase rapidly into the boundary of the inner plasma region. The ion plasma contains both cold and dense material along with hot and more tenuous matter. The sources and sinks for this material which exist in the outer magnetosphere of Saturn and their implications for the composition of the heavy ion plasma are discussed. Author

N83-29159# Ames Lab., Iowa.
A STUDY ON THE DETERMINATION OF MAJOR, MINOR AND TRACE CONSTITUENTS IN METEORITES BY INDUCTIVELY COUPLED PLASMA-ATOMIC EMISSION SPECTROSCOPY (ICP-AES)
Zhanxia Zhang, Bruce R. Bear, and Velmer A. Fassel 1982 21 p refs Presented at the 33rd Pittsburgh Conf. on Anal. Chem. and Appl. Spectroscopy, Atlantic City, N.J., 8 Mar. 1982 Prepared in cooperation with Iowa State Univ.
(Contract W-7405-eng-82)
(DE82-016383; IS-M-375; CONF-820381-1) Avail: NTIS HC A02/MF A01

A study on the ICP-AES determination of 42 major and trace elements in meteorites was described. The sample was dissolved in a mixture of aqua regia and HF in a sealed Teflon bomb and boric acid is added after dissolution to complex the excess HF. The final solution is transformed into an aerosol via ultrasonic nebulization. The reference solutions employed for calibrating the spectrometers contained only the HF-aqua regia-HS3BO3 matrix. A polychromator and a programmable scanning monochromator interfaced to the same plasma excitation source provided the spectroscopic data. The accuracy of the determination was assessed by: (1) comparing our results with those obtained by neutron activation and X-ray fluorescence; and (2) by analyzing several geological references samples (US Geological Survey and Canadian Certified Reference Materials). The analytical results showed good agreement. The relative standard deviation of the determination of the major elements ranged from 0.5 to 2%, and of the minor and trace elements from 0.5 to 8%. DOE

N83-29160# Ernst-Mach-Inst., Freiburg (West Germany).
OPTIMIZATION OF AN IMPACT FACILITY FOR METEOROID SIMULATION EXPERIMENTS
W. Junkermann, E. Schneider, and A. Stilp May 1982 19 p refs In GERMAN; ENGLISH summary
(Rept-5/82) Avail: NTIS HC A02/MF A01

The construction and operating principle of a light gas gun with projectile velocities sufficiently high for meteoroid simulation are described. A radar system for measuring the projectile velocity was tested. Good performance is obtained, especially in the range of high projectile velocities, where opto-electronic methods cannot be applied. Powder nature and quality, drive gas nature, drive tube dimension, tunnel dimension, drive gas pressure, piston weight and projectile weight were varied. Drive tube diameter is of minor importance, but an increased length to diameter ratio of the tunnel gives higher velocities. The velocity of the drive piston is decisive for an optimum energy utilization. Projectile velocity increases with decreasing drive gas pressure. Author (ESA)

N83-28019# Joint Publications Research Service, Arlington, Va.
VENERA-13 MASS SPECTROMETER STUDIES OF ATMOSPHERIC GASES ON VENUS
V. G. Istomin *In its* USSR Rept.: Space, No. 21 (JPRS-83430) 9 May 1983 p 56-65 refs Transl. into ENGLISH from Zemlya i Vselennaya (Moscow), no. 5, Sep. - Oct. 1982 p 19-25 (For primary document see N83-28011 17-12)
Avail: NTIS HC A07

92 SOLAR PHYSICS

Includes solar activity, solar flares, solar radiation and sunspots.

N83-29161 Colorado Univ., Boulder.
OSCILLATORY PROBES AND DIRECT OBSERVATIONS OF SOLAR CONVECTION Ph.D. Thesis
Frank Hill 1982 246 p
Avail: Univ. Microfilms Order No. DA8229839

Comparison of power in spatial and temporal power diagrams obtained on different days at Sacramento Peak Observatory (SPO) reveals shifts in the positions of the ridges that may be due to

different large-scale subsurface temperature and velocity fields being brought beneath the observing window by solar rotation. These shifts appear to be periodic in time, recurring after 5 and 27 days. Analysis of a series of suitably time-averaged and spatially filtered observations of vertical velocities obtained in the Mg I lambda 5173 spectral line suggests that the lifetime of mesogranulation is at least two hours, though correlation estimates yield shorter lifetimes. Comparison of simultaneous velocity observations carried out with SMM and at SPO shows that steady flows of supergranular scale are able to penetrate upward at least to the transition region. The horizontal and vertical components of the flow both have similar 4 km/s rms amplitudes at the height of formation of the C IV lambda 1548 line, implying that little braking of the flow is occurring in this region. Correlations of intensity and steady velocity in the transition region show a bimodal pattern which may be due to a combination of convectively and magnetically controlled flows. Dissert. Abstr.

N83-29162*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE ACCELERATION AND PROPAGATION OF SOLAR FLARE ENERGETIC PARTICLES
M. A. Forman (State Univ. of N.Y., Stony Brook), R. Ramaty, E. G. Zweibel (Colorado Univ., Boulder), T. E. Holzer, ed., D. Mihalas, ed., P. A. Sturrock, ed., and R. K. Ulrich, ed. Aug. 1982 85 p refs Repr. from The Physics of the Sun, Chapter 11
(NASA-TM-83989; NAS 1.15:83989) Avail: NTIS HC A05/MF A01 CSCL 03B

Observations and theories of particle acceleration in solar flares are reviewed. The most direct signatures of particle acceleration in flares are gamma rays, X-rays and radio emissions produced by the energetic particles in the solar atmosphere and energetic particles detected in interplanetary space and in the Earth's atmosphere. The implication of these observations are discussed. Stochastic and shock acceleration as well as acceleration in direct electric fields are considered. Interplanetary particle propagation is discussed and an overview of the highlights of both current and promising future research is presented. A.R.H.

N83-29163*# Stanford Univ., Calif. Inst. for Plasma Research.
A DYNAMIC MODEL FOR THE TRANSITION REGION
S. K. Antiochos Nov. 1982 22 p refs
(Contracts NGL-05-020-272; Grant NAGw-92; Contract N00014-75-C-0673)
(NASA-CR-170351; NAS 1.26:170351; AD-A125046; SU-IPR-947) Avail: NTIS HC A02/MF A01 CSCL 03B

We develop a model for the lower transition region that can account for the persistent and ubiquitous redshifts that are observed in the UV emission lines formed at these temperatures. We show that these shifts are not likely to be due either to falling spicular material or to steady-state siphon flows. Our model consists of two key ingredients. The redshifted radiation orginates from a minority of flux tubes which have higher gas pressures than their surroundings, and consequently have their transition regions situated below the transition regions of their surroundings. The coronal heating in these loops is impulsive in nature, and this is responsible for the transient mass flows. Our studies, therefore, favor theories for coronal heating which involve flare-like magnetic-energy release. Author (GRA)

N83-29164*# California Univ., Berkeley. Space Sciences Lab.
ENERGETICS AND INTERPLANETARY EFFECTS OF THE AUGUST 14 AND 18, 1979 SOLAR FLARES
S. R. Kane, M. K. Bird, V. Domingo, G. Green, G. R. Gapper, A. Hewish, R. A. Howard, B. Iwers, B. V. Jackson, and U. Koren Jan. 1983 43 p refs Submitted for publication
(Contracts NAS5-25980; F19628-80-C-0208; AF Proj. 2311)
(NASA-CR-170359; NAS 1.26:170359; AD-A125096; SR-3; SSL-83-100MA; AFGL-TR-83-0023) Avail: NTIS HC A03/MF A01 CSCL 03B

The STIP Event No. 1, which covered the time interval August 14 - 18, 1979, was characterized by two energetic flares: one on August 14 (approximately 1243 UT) and the other on August 18 (approximately 1400 UT). The hard X-ray, soft X-ray, optical, radio and energetic particle emissions from these flares and their interplanetary effects were observed with many instruments in space and on the ground. A summary of some of these observations is presented. The results of a preliminary analysis relevant to the acceleration of particles, coronal transients and evolution of shocks are as follows: (1) During the August 14 flare energetic particles were probably accelerated but could not escape the Sun in large numbers. On the other hand, during the August 18 flare the acceleration of high energy particles occurred relatively high in the corona, from whence they could easily escape into interplanetary space but could not penetrate down to the lower altitudes in the solar atmosphere in large numbers. (2) The kinetic energy of the coronal transient associated with the August 14 flare was much larger than the total energy of energetic electrons, indicating an additional energy source for the transient. (3) The shock associated with the August 18 flare extended to greater than 2 (3.14) steradians. The shock maintained its speed from the flare site to a distance of approximately 35 R and then decelerated to a distance of approximately 1 AU as approximately R to the minus 0.8 power. Author (GRA)

N83-29165*# Stanford Univ., Calif. Inst. for Plasma Research.
CHROMOSPHERIC HEATING BY ELECTRON AND PROTON BOMBARDMENT IN THE SOLAR FLARE OF JUNE 7, 1980
A. Gordon Emslie Dec. 1982 15 p refs
(Grants NGL-05-020-272; NAGw-92)
(NASA-CR-172767; NAS 1.26:172767; AD-A123954; SU-IPR-950) Avail: NTIS HC A02/MF A01 CSCL 03B

Using observations of both hard x-rays and gamma-rays in the large solar flare on June 7, 1980, we infer the amount of chromospheric heating due to bombardment both by non-thermal electrons and by protons, respectively. If a thick-target model for the X-ray bremsstrahlung is adopted, then proton heating is shown to be important only in the lower chromosphere; however, if the hard X-rays are substantially thermal in origin, then proton heating may play an important or indeed dominant role in determining the structure of the entire flaring chromosphere. Author (GRA)

N83-29166# National Oceanic and Atmospheric Administration, Boulder, Colo. Space Environment Lab.
NOAA-ERL SOLAR ULTRAVIOLET RADIATION AND CLIMATE RESEARCH PROJECT: PROGRAM DESCRIPTION AND PROGRESS Progress Report
Richard F. Donnelly, Anita Baker-Blocker, S. David Bouwer, and Judith Lean Sep. 1982 83 p refs Prepared in cooperation with Colorado Univ., Boulder
(PB83-153353; NOAA-TM-ERL-SEL-64; NOAA-82122902) Avail: NTIS HC A05/MF A01 CSCL 03B

Research of the temporal variations of solar ultraviolet radiation is reviewed. Progress on a collaborative program to analyze Dr. D. F. Heath's NIMBUS-7 SBUV measurements of the solar UV spectral irradiance is summarized. Significant progress has been made on determining the wavelength and temporal characteristics of UV variations caused by solar active region evolution (birth, growth, peak, decay and occasionally rejuvenation) and by solar rotation (area foreshortening, center-to-limb darkening and limb occulation). Work on trying to corroborate an observed semiannual UV variation has commenced. Extensive progress on modeling solar UV variations has been achieved. Support for improved rocket-flight measurements of solar UV spectral irradiance is discussed. The importance of obtaining accurate recalibration is stressed. Author (GRA)

93 SPACE RADIATION

Includes cosmic radiation; and inner and outer Earth's radiation belts.

For biological effects of radiation see *52 Aerospace Medicine*. For theory see *73 Nuclear and High-Energy Physics*.

N83-29167 Maryland Univ., College Park.
HIGH-ENERGY ASTROPHYSICAL GAMMA-RAY PRODUCTION

IN GASES AND SOLIDS Ph.D. Thesis
Daniel Joseph Morris 1982 288 p refs
Avail: Univ. Microfilms Order No. DA8227989

The production of gamma rays with energy above 10 MeV from the interaction of cosmic rays with matter is simulated using Monte Carlo methods. The first case considered is the interaction of cosmic rays in the Earth's atmosphere. The gamma ray flux is calculated as a function of direction, energy, and atmospheric depth. These calculations are compared with experimental results from a number of balloon flights, and with the Earth albedo observed the SAS-2 satellite. Calculations for cosmic ray interactions with the lunar surface are presented, and the results compared with an upper limit for the lunar albedo based on SAS-2 measurements. These same methods are applied to the interaction of cosmic rays with the interstellar medium. A number of models for astrophysical gamma ray production are examined, and results of the Monte Carlo calculations are used to set limits on various parameters of these models. Part of the balloon data was obtained during the flight of a digitized spark chamber gamma ray telescope. This telescope has an active area of 50 cm x 50 cm and is sensitive to gamma rays of energy above about 10 MeV. The construction and operation of this instrument are described.
Dissert. Abstr.

N83-29168 Princeton Univ., N. J.
A BALLOON BORNE MASER MEASUREMENT OF THE ANISOTROPY OF THE COSMIC BACKGROUND RADIATION Ph.D. Thesis
Dale John Fixsen 1982 90 p
Avail: Univ. Microfilms Order No. DA8228173

A 24.6 GHz maser served as a low noise front end amplifier for the radiometer. The system noise temperature was 33 K and the bandwidth was 300 MHz. Effects of low frequency drifts were reduced by switching between two horns and by rotating the gondola. A model of galactic radiation was subtracted from the antenna temperature distribution, and the remainder was fit to dipole and quadrupole distributions. The parameters obtained for the dipole distribution are: Tx = 2.9 + or - .13 Ty = .84 + or - .07, Tz = .40 + or - .06 mK antenna temperature, in celestial coordinates. No significant quadrupole was found, but an upper limit of .13 mK was placed on the rms value of a quadrupole distribution. The results are consistent with a model in which the sun is moving 353 + or - 15 km/s towards 11.0 + or - .15 hours right ascension, -7 deg + or - 2 deg declination, in uniform 2.7 K blackbody radiation.
Dissert. Abstr.

N83-29169*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
HEAVY ION TRANSPORT IN THE STRAIGHT AHEAD APPROXIMATION
John W. Wilson Jun. 1983 22 p refs
(NASA-TP-2178; L-15623; NAS 1.60:2178) Avail: NTIS HC A02/MF A01 CSCL 03B

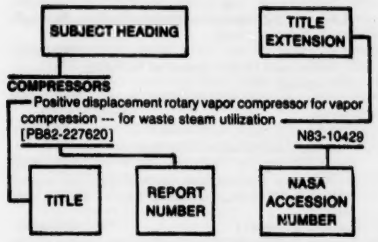
An as yet unsolved problem in space radiation protection is the necessary relation between the external cosmic ray heavy ion fluence and the resultant environment within the spacecraft. Such a relation involves the transport of such ions through extended materials. Presented is a derivation of the solution of the transport equation for heavy ions in the straight ahead approximation for directed beam applications. An iterative scheme for the solution of the inhomogeneous integral transport equations is applied to a neon ion beam in water. The iterative scheme requires transport coefficients as input, which are determined from the available data on ion nuclear reactions. The iteration converged for the neon beam in water. Thus this iterative scheme appears to be a suitable approximation of heavy ion transport.
Author

99 GENERAL

N83-29170*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
HISTORICAL DEVELOPMENT OF WORLDWIDE SUPERSONIC AIRCRAFT
M. Leroy Spearman May 1983 40 p
(NASA-TM-85637; NAS 1.15:85637) Avail: NTIS HC A03/MF A01 CSCL 01B

Some major milestones in the progression of airplane speeds from subsonic to supersonic are traced. Historical background is included on work done prior to the Twentieth Century, but the major emphasis is on the Twentieth Century developments after the man carrying airplane became a practical reality. The techniques of increasing airplane speed revolve around means of increasing the propulsive force and means of reducing the airframe resistance (drag). With the changes in speed, the attendant changes in flow patterns due to the compressibility of air introduce some aerodynamic problems. In addition, geometric changes introduced to combat the effects of compressibility also promote aerodynamic problems. Some of the solutions to these problems are illustrated, and many design features that evolved are discussed.
A.R.H.

Typical Subject Index Listing



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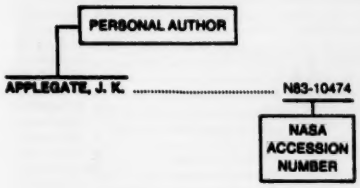

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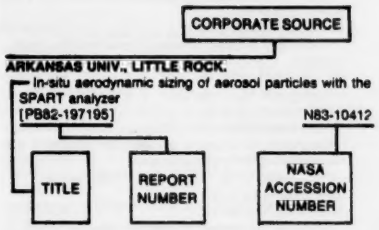

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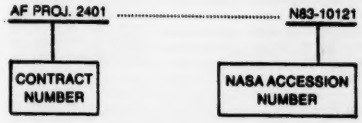

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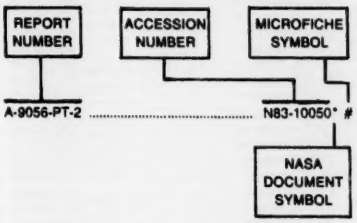

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DOE/ID-12154/T2 ..... N83-28675 #

DOE/LC-10787/89 ..... N83-28698 #

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DOE/NBM-2017678 ..... N83-28700 #
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DOE/NE-10189/1 ..... N83-28702 #

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DOE/PC-30303/T4 ..... N83-28392 #
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DOE/PC-40091/T1 ..... N83-28135 #
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DOE/PC-40804/T2 ..... N83-28391 #
DOE/PC-40805/1 ..... N83-28778 #
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DOE/PC-42682/T2 ..... N83-29020 #

DOE/RA-50076/13 ..... N83-28657 #

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EGG-M-06362 ..... N83-28221 #
EGG-M-10482 ..... N83-28476 #
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ESA-TT-736 ..... N83-28462 #
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NOAA-TM-ERL-NSSL-94 ..... N83-28839 #

NOAA-TM-ERL-SEL-64 ..... N83-29166 #

NOAA-TM-NMFS-F/NEC-17 ..... N83-28848 #

NOAA-TM-OMPA-23 ..... N83-28771 #

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NRL-MR-5035 ..... N83-28210 #
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OWRT-B-062-ARK(1) N83-28773 #
OWRT-B-106-VA(A) N83-28571 #
OWRT-B-120-VA(1) N83-28772 #

OWRT-C-00180-D(0491)(1) N83-28081 #

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PAR-82-19 N83-29038 #

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PB83-136986 N83-28747 #
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PB83-145193 N83-28238 #
PB83-147728 N83-28748 #
PB83-148080 N83-28288 #
PB83-148148 N83-28239 #
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PB83-148502 N83-28171 #
PB83-148742 N83-28502 #
PB83-150029 N83-28564 #
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PNL-SA-10071 N83-28911 #
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PWA-5515-176 N83-27993* #

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RAE-TM-FS(F)-442 N83-28292
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REPT-5/82 N83-29160 #
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RFP-3426 N83-28647 #

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RR-191 N83-28971 #
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SAM-TR-82-37 N83-28966 #
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SAND-81-2018 N83-28263 #
SAND-81-2244C N83-28685 #
SAND-81-2441C N83-28679 #
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SAND-83-8202 N83-28709 #
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SATR-2 N83-28306 #

SC5344.6SA N83-28306 #

SD-TR-83-05 N83-28433 #

SDSU/AE/EM/TR-83-01 N83-28381 #

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SER-A-95 N83-29150

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